3.0 EXISTING ENVIRONMENT AND ENVIRONMENTAL IMPACTS

GENERAL SITE DESCRIPTION

The 132-hectare (327-acre) STM site is located on the southeast side of STM, north of Interstate 70 (I-70) and west of the I-70 and Denver West Boulevard interchange in unincorporated Jefferson County near Golden, Colorado. The areas surrounding the STM site are within portions of unincorporated Jefferson County, as well as the cities of Golden and Lakewood in Jefferson County. The Pleasant View Metropolitan District, within unincorporated Jefferson County, overlies portions of each of these jurisdictions. These jurisdictions are described and illustrated in detail in the SWEA (DOE 2003).

Of the 132 hectares (327 acres) at the STM site, 55 hectares (136 acres) are available for development. A total of 71.6 hectares (177 acres) is protected by a conservation easement, and development on 5.7 hectares (14 acres) is restricted by utility easements. There are currently seven laboratory facilities, a few small test facilities, and several support buildings on the site. The site includes acreage on the STM mesa top, slope, and toe, and approximately 10 hectares (25 acres) that were formerly part of the Colorado National Guard facility, established between 1903 and 1924, at Camp George West. Figure 2-1 shows the STM site layout, and Figure 2-3 shows the locations of the five proposed improvement projects that are the subject of this ~~draft~~ SWEA/S-II.

For aspects of the existing environment that remain essentially unchanged since the SWEA (DOE 2003) and subsequent STM EAs (DOE 2007, 2008) were issued, this ~~draft~~ SWEA/S-II reiterates or summarizes the descriptions found in those EAs. Otherwise, this ~~draft~~ SWEA/S-II describes relevant environmental changes since those EAs were issued.

The impacts expected from the Proposed Action are generally bounded by the impacts reported in the SWEA (DOE 2003) and subsequent STM EAs (DOE 2007, 2008). In cases where impacts from the Proposed Action may not be adequately bounded by or fully discussed in those EAs, more detailed discussions are provided. Unless otherwise noted or updated, the summary descriptions of the existing environment for specific resources areas provided in Section 3.1 are consistent with the descriptions provided in those EAs.

3.1 Environmental Impacts of the Proposed Action

3.1.1 Land Use

3.1.1.1 Existing Environment

Current land use at the site includes research and development facilities, office space, support buildings, and testing areas. The STM complex provides approximately 56,900 square meters (612,000 square feet) of facilities and workspace for approximately 1,600 staff, including federal employees, contractors, and temporary personnel, of which approximately 1,300 are NREL employees.

The proposed ESIF, WHF expansion, and most of the Phase 2 Site Infrastructure Improvements would be located in Zone 4, the center of the STM complex. The 22-hectare (55-acre) Zone 4 includes major DOE facilities such as the Solar Energy Research Facility (SERF), Field Test Laboratory Building (FTLB), and Science and Technology Facility (S&TF). It also includes wet laboratories and space for research such as experiments with hydrogen (H_2), toxic gases, PV, biofuels, and industrial technology.

The proposed new second access road and associated new connecting roads would be located in or immediately east or west of Zone 6 or south of Zone 5. Parts of Corridors B, C, and D traverse the Camp George West Historic District, which housed the Colorado National Guard beginning in 1903. Currently, the Colorado Department of Corrections, the Colorado Department of Transportation (CDOT), and the Colorado State Highway Patrol maintain a presence within the district's boundaries. The Pleasant View Community Park is also inside the boundaries. There are also private residences within Corridors A, C, D and E. However, the majority of land within Corridors C and D is grassland and riparian vegetation along Lena Gulch. Corridors A and E are generally made up of residential housing or are adjacent to residential land uses. Other existing land uses associated with Corridor E include an abandoned mobile home park bordering Isabell Street and a storage facility. The Richards Heights subdivision is located adjacent to Corridor E. Quaker Street generally runs north and south within Corridor A. Table 3-1 shows the ownership of lands within each corridor alternative.

Table 3-1. Land Ownership within Corridor Alternatives for Proposed Second Access Road

Corridor	Land Ownership		
	Private	County	State
A	100%	--	--
B	--	100%	--
C	100%	--	--
D	50%	25%	25%
E	100	--	--

Note: Shown in general percentages traversed by each corridor alternative

The 10-hectare (25-acre) Zone 5 includes the Visitors Center and East Entrance; otherwise, this zone is undeveloped. The zone is designated for general research and development with dry laboratories and minimal use of hazardous materials

3.1.1.2 Impacts of the Proposed Action

The land use and planning impacts of the proposed site development projects on the STM site are bounded by the discussion of impacts presented in the SWEA (DOE 2003) and subsequent STM EAs (DOE 2007, 2008); these impacts are summarized in the following sections.

Energy Systems Integration Facility

Land use for the proposed ESIF would be consistent with the designated uses of NREL Planning Zone 4. If the ESIF were built as a single-story building, the building footprint would cause approximately 23,230 square meters (250,000 square feet) of undeveloped site land to be converted to facility use, and another 1,860 to 2,800 square meters (20,000 to 30,000 square feet) of land to be converted to outdoor research test pads. If the ESIF were built as a multi-story building, the footprint would be smaller. The single-story or multi-story options are viable on either alternative pad location proposed for the ESIF.

Site Infrastructure Improvements

The proposed site infrastructure improvements would convert approximately 40,500 square meters (436,500 square feet) of undeveloped site land into parking, new paved roads, and infrastructure.

Second Access Road

Each proposed corridor would convert differing amounts of natural vegetation, affect private residences, and require upgrades to existing roadways to construct a proposed second access road into the STM site. Assuming a finished roadway of 11 meters (36 feet) wide and an 18-meter (60-foot) wide ROW containing gutters, curbs, and sidewalks, the impacted area for each proposed corridor would be as follows:

- Corridor A – would require expansion of the Quaker Street existing ROW, which would include a wider road to meet applicable requirements. Although not affecting any physical structures, this corridor could require the conversion of approximately 0.4 hectare (1.0 acre) of residential yards to ROW. The yards of up to 15 private residences could be directly affected.
- Corridor B – would convert approximately 0.4 hectare (1.0 acre) of natural vegetation into a roadway, require either a new crossing or modification of the existing crossing over Lena Gulch, and directly affect no private residences.
- Corridor C – would convert approximately 0.4 hectare (1.0 acre) of residential uses and natural vegetation into a roadway, require a new crossing over Lena Gulch, and directly affect up to two private residences, depending upon route selection.
- Corridor D – would convert approximately 0.8 hectare (2.00 acres) of natural vegetation into a roadway; require a new crossing or modification of the existing crossing over Lena Gulch; possibly require an upgrade of 0.16 kilometer (0.1 mile) of Kilmer Street affecting the ROW in which there are currently numerous historic structures, or directly affect one or two private residences if extended to Isabell Street, which may require upgrades to the existing crossing over Lena Gulch; and could affect operations at the state corrections facility or National Guard facilities, and workers utilizing buildings along Kilmer Street and adjacent buildings.
- Corridor E – would require expansion of the existing Isabell Street ROW, which would include a wider road to meet applicable requirements. Although not affecting any physical structures, this corridor could require the conversion of approximately 0.5 hectare (1.3 acres) of residential yards to ROW. The yards of up to 10 to 12 private residences could be directly affected. This corridor also may require upgrades to the existing crossing over Lena Gulch.

Expansion of the Waste Handling Facility

The proposed expansion of the WHF would be confined to Zone 4. The expansion would require the conversion of approximately 370 square meters (4,000 square feet) of undeveloped land to facility use.

Expansion of the Visitors Center

The proposed expansion of the Visitors Center would be confined to Zone 5. The expansion would require the conversion of approximately 600 square meters (6,500 square feet) of undeveloped land to facility use.

3.1.2 Traffic

3.1.2.1 Existing Environment

Section 3.1.2.1 of the May 2008 SWEA/S-I (DOE 2008) provides a detailed description of the existing traffic environment at the STM site, including discussions of transportation facilities and circulation,

existing roadways and traffic volumes, existing operating conditions, and future baseline traffic volumes and operating conditions. The SWEA/S-I (DOE 2008) assumed that a second, right-turn lane would be constructed by 2012 at the Denver West Parkway/Denver West Marriott Boulevard (DWP/DWMB) intersection, as required by the approved traffic mitigation plan prescribed in the EA. Also included in SWEA/S-I are data and figures suggesting that without a new access road, unacceptable levels of service (LOS) would occur on the roadway system associated with staffing increases at the STM site. That description of the existing traffic environment (existing roadway network and existing traffic volumes and conditions), which was based on recent traffic studies at the STM site (FHU 2008), remains current and is incorporated into this section by reference.

Traffic operational conditions are described with a LOS, a qualitative measure of traffic flow based on the average delay per vehicle at a controlled intersection. LOS are described with a letter designation of A, B, C, D, E or F. A LOS "A" represents conditions resulting in minimal delay, while a LOS "F" represents conditions resulting in much longer delays. Typically, a LOS "D" or better is considered to be acceptable operational conditions. A second traffic impact analysis report titled *National Renewable Energy Laboratory South Table Mountain Facility Traffic Impact Study Revision* was prepared in September 2009 (Baseline 2009) to update the previously completed 2008 traffic impact study (FHU 2008) and to assess potential traffic volumes and operating conditions associated with the new access road proposed as part of this action.

Additionally, SWEA/S-I and its accompanying FONSI make commitments to undertake mitigating actions such as TDM measures; those commitments were made to prevent unacceptable traffic impacts. Those mitigating efforts would continue under the Proposed Action in this SWEA/S-II and are incorporated by reference. The alternative corridors that are being considered as part of the Proposed Action are described and shown in Chapter 2 of this SWEA/S-II.

3.1.2.2 Impacts of the Proposed Action

Near-term (2012) Traffic Conditions

Due to increasing funding levels at NREL for site buildout, the staffing projection of 1,430 employees used in the 2007 and 2008 traffic modeling underestimated the staffing levels that would occur at the STM site in the near term (2012). Under the Proposed Action, an estimated 2,228 employees would be on the STM site by 2012. Therefore, multiple traffic analyses were conducted to determine critical expansion-level thresholds associated with alternative access corridors and to identify key mitigation measures. Specifically, this "sensitivity evaluation" was conducted to determine the impact that increased employment levels would have on peak-hour traffic operations and delays. These analyses determined that, even with the planned improvements to the DWP/DWMB intersection, staffing levels beyond approximately 1,500 employees would begin to degrade the LOS at this intersection to unacceptable levels without a second access road (FHU 2008). Current staffing plans predict that this threshold would be crossed sometime during the summer of 2010. The most recent traffic study (Baseline 2009) examined the effects of optimizing the timing of traffic signals in the DWP/DWMB/I-70 intersections and determined that although conditions at the DWP/DWMB intersection could be temporarily improved, even under optimized conditions, the west bound exit ramp of I-70 would degrade to unacceptable levels (LOS "E") by 2012 during the morning rush hour without a second access road.

Based on the updated staffing levels, operations at the STM site are projected to generate approximately 8,622 average daily trips (ADT) in 2012 (Baseline 2009). The 2012 traffic volumes are based on previously conducted analysis and traffic data prepared in 2008, as well as trip generation rates associated with the Institute of Transportation Engineers *Trip Generation* manual. It should also be noted that for

traffic impact analysis purposes, area growth and consequent traffic were projected to grow at an average rate of approximately 1.0 percent per year. This slight growth rate is not associated with the Proposed Action but instead is attributable to the project area (Baseline 2009).

Based on the need and recommendation of a second access road to the STM site, the traffic impact study in this SWEA/S-II assessed the potential effects that the Proposed Action would have on the existing roadway system and operating conditions as a result of adding a new access road. The traffic impact study assessed the five different access alternatives (Figure 2-4) described in Chapter 2.

Long-term Traffic Conditions

Also considered under the Proposed Action are staffing projections once buildout occurs. An estimated 1,668 additional employees beyond 2012 levels, are expected on the STM site by 2030, resulting in an estimated total of 3,896 employees. Similar to the near-term analysis (2012) described above, due to the increasing funding levels at NREL for the site buildout, the staffing projection of 2,675 employees used in the 2007 and 2008 traffic modeling underestimated the staffing levels that would occur at the STM site in the long term (2030).

Using the revised staffing level projections, the results of the new analysis show that the DWP/DWMB intersection and the intersection of Denver West Marriott Boulevard and the I-70 westbound off-ramp would be beyond capacity (LOS "F") in 2030 if no additional access to the STM site is constructed. Further analyses show that the DWMB/I-70 intersection would operate at LOS "F" in the morning and "E" in the evening by 2015, and the DWP/DWMB intersection would be operating at and unacceptable level (LOS "E") by 2020 if no additional access to the STM site is constructed (Baseline 2009). Operations at the STM site are projected to generate approximately 15,078 ADT in 2030 (Baseline 2009).

Project Traffic Conditions

Table 3-2 provides the expected traffic conditions associated with each of the proposed access road corridors in both the near term (2012) and the long term (2030). Table 3-2 also provides the expected LOS for the nearest intersection affected by each corridor alternative.

As shown in Table 3-2, all intersections affected by construction and operation of the proposed second access road would operate at acceptable LOS for all of the alternative corridors in 2012. In comparison, as discussed earlier, the west bound ramp of I-70 would be at an unacceptable LOS by 2012, without a second access road.

Corridor Impacts

Corridor A – If Quaker Street were used as a second access road, the existing roadway would be expanded to a width of 36 feet. This alternative would require a ROW expansion into the front yards of current residences but would avoid any structures. The existing speed bumps would be removed ~~since~~ because they would impede commuter traffic. The intersection of Quaker Street and South Golden Road would require additional turn lanes to accommodate the increase in traffic volume. As shown on Table 3-2, in 2012 the peak rush-hour traffic volume would increase by 235 percent during the morning rush and by 166 percent during the evening rush. Currently, the residents of Quaker Street experience approximately 2 to 3 cars passing by every minute during morning and evening rush hours. If Quaker Street were used as a second access road, residents would observe approximately 8.6 to 9 cars every minute of the morning and evening rush hours, or approximately 6 to 7 more cars per minute than they experience under current conditions.

Table 3-2. Comparison of Traffic Impacts among Corridor Alternatives

Corridor[a]	Conditions	2012				2030			
		Peak Rush-Hour Traffic Volumes[c]		LOS[a]		Peak Rush-Hour Traffic Volumes		LOS	
		AM	PM	AM	PM	AM	PM	AM	PM
DWP/DWMB	No Second Access Road[b]	952	1,155	B	C	1,610	1,828	E	F
	With Second Access Road	579	810	B	B	957	1,223	B	C
	Percent Decrease (%)	39	30	--	--	41	33	--	--
A	Used as Second Access Road	520	537	A	C	838	847	C	D
	Baseline - No Action	155	202	B	B	200	254	A	B
	Percent Increase (%)	235	166	--	--	319	233	--	--
B/C	Used as Second Access Road	375	345	B	C	653	602	B	D
	Baseline - No Action	0	0	A	C	0	0	A	D
	Percent Increase (%)	NA[d]	NA	--	--	NA	NA	--	--
B/D (using Kilmer Street)	Used as Second Access Road	448	384	A	C	742	652	B	F
	Baseline - No Action	73	40	A	B	89	49	A	D
	Percent Increase (%)	514	860	--	--	734	1,231	--	--
B/D/E (using Isabell Street)	Used as Second Access Road	466	436	A	B	765	716	B	D
	Baseline - No Action	91	92	A	A	112	113	A	C
	Percent Increase (%)	412	374	--	--	583	534	--	--
E	Used as Second Access Road	466	436	A	B	765	716	B	D
	Baseline - No Action	91	92	A	A	112	113	A	C
	Percent Increase (%)	412	374	--	--	583	534	--	--

a. Traffic numbers and LOS apply to the intersection of each corridor with South Golden Road, except Denver West Parkway.
b. No Second Access Road: Denver West Marriott Boulevard provides the major access to the STM site; no second access road built.
c. Peak rush hour traffic volume means the amount of traffic occurring during any single hour during morning or evening rush hours which is typically between 7:00 to 9:00 AM and 4:00 to 6:00 PM
d. NA = not applicable.

Corridor B/C – Because there is no existing road within this corridor, any route within this corridor would require new construction, including a new bridge over Lena Gulch. Intersection improvements such as traffic signals would be required at either the Moss Street or McIntyre Street intersection on South Golden Road. The proposed roadway would cross both public and private land. ~~Since n~~No roadway currently exists along this corridor, so there would be no relevant percentage increase in traffic experienced by residents. The two residences within this corridor would experience the entire traffic volume projected in Table 3-2 if this corridor were used; under current conditions, they experience no traffic.

Corridor B/D (using Kilmer) – Except for Kilmer Street, there is no existing road within this corridor; therefore, any proposed route within this corridor would require new road construction, including a new bridge or reconstruction of the existing bridge over Lena Gulch. Intersection improvements such as traffic signals would be required at the Kilmer Street/South Golden Road intersection. This proposed roadway would cross public land.

To meet applicable regulations, if Corridor B/D were used as a second access road, Kilmer Street would have to be expanded to a width of 36 feet. This would require the expansion of the ROW and could require the relocation of structures, many of which either are listed on the National Register of Historic Places (NRHP) or contribute to the listed Camp George West Historic District.

As shown on Table 3-2, in 2012 the peak rush-hour traffic volume would increase by 514 percent during the morning rush and by 860 percent during the evening rush. Currently, occupants of the buildings along Kilmer Street experience approximately 0.5 to 1 car passing by every minute during morning and evening rush hours. If Corridor B/D were used as a second access road, building occupants along Kilmer Street would observe approximately 6 to 7.5 cars every minute of the morning and evening rush hour, or approximately 6 to 7 more cars per minute than they experience under current conditions.

Corridor B/D/E (using Isabell) – Except for a short stretch of Isabell Street along the southern half of Corridor E, there is no existing road within this proposed corridor; therefore, any route within this corridor would require new road construction, including a new bridge or reconstruction of the existing bridge over Lena Gulch. Intersection improvements such as traffic signals would be required at the Isabell Street/South Golden Road intersection. This proposed corridor would cross public and private land.

Depending upon route selection, some historic structures could be affected. As shown on Table 3-2, in 2012 the peak rush-hour traffic volume on Isabell Street would increase by 412 percent during the morning rush and by 374 percent during the evening rush. Currently, the one or two residences along the stretch of Isabell Street within Corridor E experience approximately 1.5 cars passing by every minute during morning and evening rush hours. If Corridor B/D/E were used as a second access road, residents on Isabell Street would observe approximately 6 to 7 cars every minute of the morning and evening rush hours, or approximately 5 to 6 more cars per minute than they experience under current conditions.

Corridor E - If Isabell Street were used as a second access road, the existing roadway would have to be expanded to a width of 36 feet. This would result in a ROW expansion into the front yards of current residences but would not require relocation of any structures. Intersection improvements such as traffic signals would be required at the Isabell Street/South Golden Road intersection.

As shown on Table 3-2, in 2012 the peak rush-hour traffic volume on Isabell Street would increase by 412 percent during the morning rush and by 374 percent during the evening rush. Currently, the residences of Isabell Street experience approximately 1.5 cars passing by every minute during morning and evening rush hours. If Corridor E were used as a second access road, Isabell Street residents would

observe approximately 6 to 7 cars every minute of the morning and evening rush hours, or approximately 5 to 6 more cars per minute than they experience under current conditions.

3.1.3 Safety and Accidents

3.1.3.1 Existing Environment

NREL implements DOE's Integrated Safety Management process to ensure that NREL operations are "low risk." Risk is formally defined as a quantitative or qualitative expression of possible loss that considers (1) the probability that a hazard-driven event will occur, and (2) the consequences of that event. An activity can be "low risk," even if the consequences of an accident might be catastrophic (may cause death or system loss), so long as the likelihood or probability of such an accident occurring is extremely remote (annual probability of 0.000001 to 0.0001).

A bounding events analysis for the proposed ESIF (Appendix C) has been conducted as part of the NEPA process to identify potential adverse conditions that may be associated with the Proposed Action. The ESIF is in the early stages of the design/build process. While some design safety features have been identified, the structured hazards analysis that would relate the design features to the accident sequences (and demonstrate that the design features are effective in preventing or mitigating the accidents) has not yet been performed. As the design/build process progresses, facility performance specifications would be identified, and their effectiveness to prevent or mitigate severe accidents would be determined. Once safety assessments are completed, it would be possible to determine whether adequate safety measures are in place to protect against all forseeable accidents, particularly low-probability accidents with the potential for off-site consequences. Integrating safety features into the design requirements allows the designer/builder to incorporate the necessary engineering controls into the ESIF design to manage risks in a manner that would protect the off-site population, non-facility workers at NREL, and facility workers. Furthermore, as the facility design evolves, additional hazards/safety assessments would be performed. Using actual equipment selections and configurations, these assessments may identify additional engineering and administrative controls to be incorporated in the design specifications. Before operations began, each activity would undergo a readiness verification to confirm that all required controls are in place and functioning.

Although it is not possible to identify all possible events early in the design phase, the goal of the bounding events analysis (Appendix C) is to consider many classes of events—for example, equipment failures, process upsets, and procedural errors—as they are understood in the early stages of a design process. The objective of this exercise is to identify the representative and bounding events for the ESIF and the control sets that would be necessary to operate the facility within an acceptable level of risk so that DOE and NREL can consider this information as part of their decision-making on the actions in this SWEA/S-II. As design and construction proceed, more detailed hazards analyses would be performed consistent with NREL's Hazard Identification and Control Procedure so that changes in the facility hazards and design are adequately captured and analyzed. This would confirm that facility workers, site workers, and the general public would be adequately protected from any events that may occur after the ESIF becomes operational. As the design process proceeds, it is anticipated that some of the assumptions upon which the analysis is based would change. As a result, new risks could be identified, other events might be shown to be impossible, and still others might fall into a different risk category.

3.1.3.2 Impacts of the Proposed Action

Based on the evaluation of between 60 and 70 event scenarios with and without safety controls (see Addendum 1 in Appendix C), four scenarios were selected for more detailed analyses to provide a

representative range of accidents in this SWEA/S-II as required by DOE's NEPA guidance.[1] These scenarios, which apply to either alternative location for the ESIF, are briefly summarized here, and are discussed in detail in Appendix C:

- **Compressor failure.** The energy of the pressure pulse from this event could cause damage for a few tens of meters. The biggest threat would be from the potential shrapnel produced.
- **Rupture of a H_2 storage vessel.** An explosion from this event could shatter non-reinforced cinderblock wall, glass would be broken, and personnel exposed to the flying glass could be injured. Individuals within 30 meters (100 feet) might experience eardrum rupture; however, the overpressure would not be sufficient to cause lung damage or produce fatal injuries. Shrapnel striking a person could produce fatal injuries.
- **Shearing off of a valve on a pressure cylinder.** The analysis shows that although the results may vary, gas storage cylinders have the potential to attain high velocities. If a worker were struck with a cylinder weighing almost 140 pounds at 100 miles per hour, serious injuries could occur. Smaller lecture-sized bottles would not be capable of doing as much damage, but they could nevertheless strike a person at a significant velocity and cause injury.
- **Leakage of H_2 into a confined space, resulting in deflagration**. If a high-pressure line ruptured, a room could rapidly attain the flammability limit. If an ignition source were present, the H_2 gas would ignite, and the resulting deflagration would destroy the laboratory from the overpressure and seriously injure any persons present.

In summary, the bounding events analysis in Appendix C identifies many possible events that could occur at the ESIF and analyzes in detail several of the more severe event sequences. The analysis concludes that several events have the potential for significant impacts to site workers and possibly the general public and emphasizes the importance of incorporating effective safety features into the design. As stated previously, NREL will use formal hazards analyses, as specified in the NREL Hazard Identification and Control Procedure, to guide the design process. The facility would not operate until it could be shown that the general public, on-site NREL workers, and ESIF workers would be adequately protected from potential accidents.

3.1.4 Visual Quality/Aesthetics

3.1.4.1 Existing Environment

The text and figures describing the visual and aesthetic environment of the STM presented in the SWEA remain current and are summarized below. Figures 3-1 through 3-3 illustrate the current overall visual environment at the STM site as viewed from off-site locations south and east of the site. The location of the ESIF in these simulations is approximate and representative of the ESIF on either of the two alternative pad locations under consideration.

The dominant visual characteristics of the existing STM site include the prominent slope and mesa top associated with STM; the DOE facilities located on top of STM; and the SERF, FTLB, S&TF, and Visitors Center located at the toe of the slope. The STM site buildings are prominent against the landscape of STM. Other less-prominent buildings occupy the western end of the site.

[1] A fifth scenario, a spill of nanomaterials, is discussed in Appendix C, but because of uncertainties in estimating the consequences of such a spill, that event is analyzed in less detail.

Figure 3-1. Current View from a Location South of the STM Site

Figure 3-2. Current View from a Location East of the STM Site

Figure 3-3. Current View from a Neighborhood Located East of the STM Site

The STM site facilities are designed to reflect the laboratory activities related to modern energy concepts. Three of the larger buildings—the SERF, FTLB, and S&TF—are terraced and set against the south slope of STM. In addition to the buildings at the STM central campus, DOE has constructed a variety of solar testing and measurement structures such as the High Flux Solar Furnace, Solar Radiation Research Laboratory, Alternative Fuels User Facility, Outdoor Test Facility, Thermal Test Facility, support facilities (e.g., shipping/receiving, facilities maintenance), and numerous PV panels situated throughout the site.

3.1.4.2 Impacts of the Proposed Action

Of the elements making up the Proposed Action in this SWEA/S-II, the construction of a new ESIF, the addition of multi-story parking structures to the STM site, and the development of a second access road have the greatest potential to affect the visual environment; therefore, these elements of the Proposed Action have been analyzed in more detail.

Energy Systems Integration Facility

As discussed previously, due to the nature of design-build contracting, a final decision on the dimensions of the ESIF would not be made until a decision is reached, based on this SWEA/S-II, to build the ESIF and a design-build contract is awarded. To support this future decision-making, a representative range of building heights has been simulated in this SWEA/S-II. Specifically, based on two options defined in Table 3-3, one-story and five-story views from the south and the east are provided with a simulation of the Research Support Facilities (RSF) currently under construction (Figures 3-4 through 3-7). These figures show the extent to which views beyond the ESIF would be obstructed. Although the final site location of the two proposed areas would be predicated on the analyses in this document and other design criteria, it is expected that the potential visual impacts noted in the following figures would be similar for either building site location.

Table 3-3. ESIF Height and Location Options

Option	Simulation Viewed From	Figure Number	Height in feet (number of stories)[a]
A	South	3-4	75 (5)
	East	3-6	75 (5)
B	South	3-5	15 (1)
	East	3-7	15 (1)

a. One story equals approximately 15 feet.

Figure 3-4. ESIF Option A – View From South
(including the Research Support Facility currently under construction)

Figure 3-5. ESIF Option B – View From South
(including the Research Support Facility currently under construction)

Figure 3-6. ESIF Option A – View From East

Figure 3-7. ESIF Option B – View From East

At either location proposed for the ESIF, there would be no potential to obstruct neighborhood views of the foothills to the west with either a one-story or five-story building. This same conclusion applies to the Visitors Center expansion and the WHF expansion.

Multi-Story Parking

Figure 3-8 shows a simulated view of the proposed multi-story parking structure. Similar to the ESIF, the dimensions of the parking structure would not be determined until the design-build contract has been awarded and preliminary design drawings have been completed. As part of the design-build process, the structure would be designed to reduce or preclude adverse visual impacts to nearby neighborhoods. As depicted in Figure 3-8, a multi-story parking structure would partially obstruct views of the foothills to the west from the neighborhood to the east of the STM site. The lower level of the multi-story parking could be partially below grade, and this design will be considered to minimize visual impacts.

A potential incompatibility could result from outdoor lighting and associated glare. The STM site is adjacent to residential uses and would be visible from off-site locations. Lighting for parking, the new second access road (described below), and for other areas could cause glare to nearby residents if not properly shielded. Design measures would be implemented in the design-build process which would require all outdoor lighting to be directed toward the ground and to be shielded so as minimize glare for sensitive receptors. Moreover, systems could be put into place to activate the on-site lighting only when the system sensed movement from a vehicle or a pedestrian in the lighting area. These systems would be evaluated during the design-build process. Based on these design measures, minimal lighting impacts are expected under the Proposed Action.

Figure 3-8. Multi-Level Parking Option

Second Access Road

Three of the corridors proposed for the second access road (Corridors B, C, and D [see Figure 2-4]) would change from undeveloped land into a roadway use. ~~Moreover, a~~Adding landscaping associated with roadway construction would ~~further~~ provide screening and improve visual compatibility for the proposed second access. Viewers near Corridors A and E would not experience an appreciable change from the current visual conditions.

3.1.5 Water Resources

3.1.5.1 Existing Environment

The description of water resources found in the SWEA remains current and is summarized below.

Surface Water

There are no perennial creeks, streams, ponds, jurisdictional wetlands, waters of the United States, or floodplains on the STM site. There may be seasonal seeps on the STM site after small amounts of surface water percolate through the soil or the fractured basalt that caps STM. Intermittent storms and other seasonal precipitation events may cause water to temporarily collect in topographic lows and drainages.

In addition to surface water in the form of seasonal seeps and stormwater runoff from the STM site, there are occasional releases of potable water from the STM site. NREL annually tests the fire suppression systems in the STM buildings, resulting in the release of up to 3,000 gallons of water per test. The fire hydrants are also tested annually, releasing about 10,000 gallons in the process. Finally, Consolidated Mutual Water District, which owns and maintains a drinking water storage tank on top of South Table

Mountain, occasionally flushes the tank, releasing as much as 30,000 gallons. These volumes may be seen flowing from the STM site.

To the south of the STM site between NREL's property boundary and South Golden Road runs Lena Gulch, a perennial stream that originates in the foothills 3 to 5 kilometers (2 to 3 miles) to the west at the mouth of Apex Gulch near Heritage Square, a retail and recreational complex on West Colfax Road. After passing through numerous commercial developments, residential areas, and several impoundments, Lena Gulch empties several miles east into Clear Creek.

The 100- and 500-year floodplains associated with Lena Gulch, as modified by mitigation measures implemented by the Pleasant View Recreation District, are shown in Figure 3-9. Figure 3-10 shows the area that could be affected by a 100- or 500-year flood event prior to the channel modifications within the Pleasant View Recreation District's boundaries. These flows could spread across portions of the STM site and across four corridors identified for the proposed second access road (Corridors B, C, D, and E). According to the *Major Drainageway Planning-Upper Lena Gulch-Phase B Report* (Boyle Engineering 1994), for the subject area adjacent to Lena Gulch, 100-year peak flows are estimated to be 2,150 to 2,700 cubic feet per second (cfs), and 500-year peak flows are estimated to be 5,700 to 6,400 cfs. Corridor A would not be affected by such flood events.

Groundwater

NREL is situated over the very western fringe of a large groundwater feature known as the Denver Basin. The Denver Basin comprises of five distinct geological formations or aquifers; NREL lies above the Denver Aquifer, which is overlain by the Dawson Formation in the southern areas of the basin. No regulatory agencies require groundwater monitoring by NREL; however, over time as many as 15 groundwater monitoring wells have been installed at the STM site. Many of the monitoring wells have since been plugged and abandoned in accordance with state regulations. Five wells remain on the STM site: one near a decades-old, abandoned amphitheater, one north of the S&TF, and three in the vicinity of the Alternative Fuels User Facility and shipping and receiving. These wells are very shallow; the deepest was completed to a depth of 25 feet. The NREL monitoring wells do not reach the deeper region of the water table beneath the STM site; they were designed to collect subsurface water as it moves downgradient to verify that there were no areas of potential contamination. The shallow wells did not show significant seasonal variation in the elevation of the water table surface. Levels measured in September 1998 were about 0.3 meter (1 foot) higher than that recorded in March 1999; levels measured in September 1999 were nearly the same as the level in March. The 1998 levels may be attributable to wetter conditions in the late summer before the September levels were measured.

During the active period of groundwater monitoring at NREL, it was estimated that the groundwater moved through the subsurface stratum at a rate of about 0.02 meter (0.05 feet) per day. The most recent analysis of groundwater quality was in 1997, when samples were collected and analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and herbicides. None of these parameters were detected. Analysis for inorganic constituents showed that groundwater at the STM site is similar in quality to groundwater elsewhere in the Denver Basin. There is no evidence that activities at the STM site have had adverse impacts on groundwater quality, and there have been no releases or discharges that could lead to groundwater contamination since the time of this sampling.

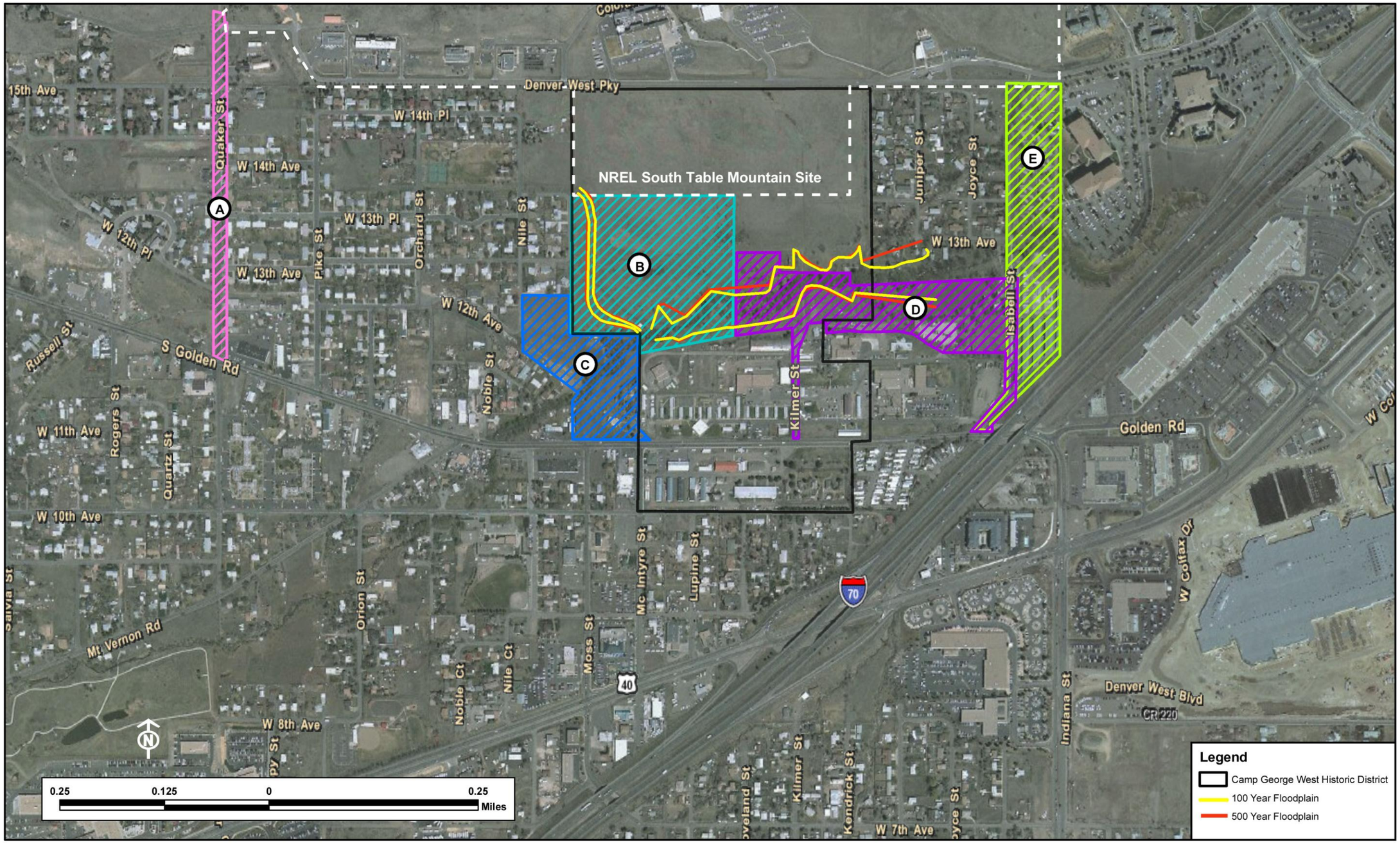

Figure 3-9. 100- and 500-Year Floodplains within Proposed Corridors for a Second Full Service Access Road to the NREL's STM Site

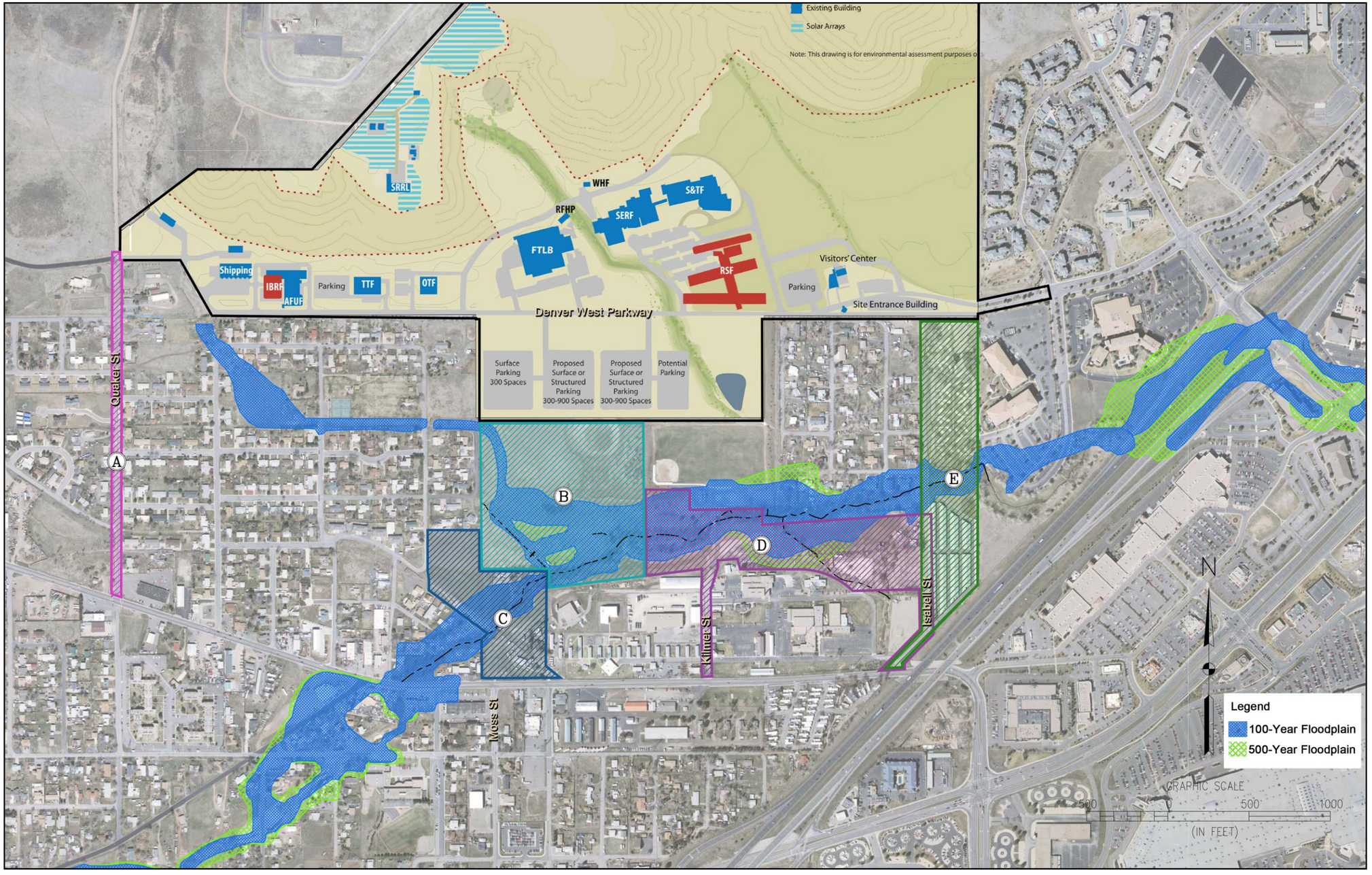

Figure 3-10. Areas that Could Potentially Be Inundated by Peak Flows Associated with 100- and 500-Year Floods

3.1.5.2 Impacts of the Proposed Action

Neither the proposed facilities nor the proposed site infrastructure improvements would result in untreated operational discharges of pollutants to surface water or groundwater. New drains, stormwater detention basins, and conveyance structures would be connected to the site's existing stormwater and sewage lines or to other existing publicly owned water discharge and treatment works.

All discharges to publicly owned treatment works would meet the requirements of the Metropolitan Wastewater Reclamation District and the Pleasant View Water and Sanitation District.

Absent mitigation measures, facility construction, new parking lots and structures, and new paved roads would increase quantities of runoff conveyed off-site and consequently could incrementally degrade down-slope surface water quality. Increased turbidity (e.g., increased water flow/runoff would suspend additional particulates) and quantities of various chemicals associated with incidental leaks from additional vehicles and construction equipment would occur. Increased runoff could increase localized on-site flooding. Absent mitigation measures, the estimated volume of increased runoff over current runoff would be approximately 19.8 acre-feet per year, most of which would be additional runoff from the proposed buildings, parking lots and roads. This estimate of increased runoff in the absence of mitigation measures is based on the following assumptions, using standard runoff coefficients from impermeable surfaces:

- Approximately 23,230 square meters (250,000 square feet) for the ESIF footprint, with an additional 1,860 to 2,800 square meters (20,000 to 30,000 square feet) of outdoor research test pads and associated infrastructure requirements (access road, services drives, etc.)
- Approximately 40,500 square meters (436,500 square feet) of proposed roads, infrastructure, and parking lots and structures
- Between 0.4 hectare (1.0 acre) and 1.00 hectare (2.7 acres) for the proposed second access road, depending on the corridor selected for construction.
- Approximately 370 square meters (4,000 square feet) for the WHF expansion
- Approximately 560 square meters (6,000 square feet) for the Visitors Center expansion

The estimate assumes one event based on Denver's historical average precipitation of 40.1 centimeters (15.8 inches) per year. The estimate does not address natural factors that could reduce runoff and mitigate the impacts of increased runoff, including the fact that precipitation occurs as multiple events throughout the year rather than a one-time event, the duration and intensity of events, land slope, soil infiltration rates, and local evaporation rates.

To address impacts from increased runoff, DOE would install a new detention basin or a series of basins in or around the central and/or eastern drainage dry stream channel and/or implement other stormwater management techniques to minimize and manage off-site runoff from the Proposed Action. In addition, DOE would regrade the surrounding terrain and/or install engineered drainage systems to direct runoff from the proposed parking lots and structures into the new detention basins, or other stormwater management systems as appropriate through NREL's stormwater program. This would be a "committed" measure. Stormwater impacts would be further minimized by complying with the provisions of NREL's U.S. Environmental Protection Agency (EPA)-issued National Pollutant Discharge Elimination System (NPDES) General Permit for construction activities.

ESIF construction crews would utilize an existing access road leading to the RSF, a new on-site structure currently under construction. The access road crosses two or more dry stream channels using culverts to permit the unimpeded flow of runoff during storm events.

If groundwater were encountered during excavations, it would be pumped from the excavation to a vegetated area rather than directly into a natural drainage. The vegetated areas would act as filters to trap sediment and reduce impacts to surface water.

As described in Section 3.1.5.1, Corridor A is not expected to be affected by 100- or 500-year storm events, and use of this corridor would not require construction within a floodplain. Corridors B, C, D, and E may be subjected to flood events based on their locations relative to Lena Gulch, and use of any of these corridors would require some construction within the floodplain of Lena Gulch. Potential adverse impacts associated with flooding events are not expected at the STM site. The volume of surface water flowing downstream through the gulch and associated tributaries is progressively diminished by diversions upstream of the STM site. While occasional intense storms may generate enough precipitation to result in surface flow that reaches the local base level, such storms commonly trigger flash flooding in the channelized gulch. Moreover, the areas that may be subject to 100- and 500-year floods are not considered sensitive areas for property damage or human safety.

3.1.6 Biological Resources and Wetlands

3.1.6.1 Existing Environment

The descriptions of biological resources and wetlands found in the SWEA remain current and are summarized below. Additional biological resource information is available in the following reports:

- Wildlife Survey (Including Migratory Birds and Raptors) at the National Renewable Energy Laboratory, South Table Mountain Site, Golden, Colorado (NREL 2005)
- Vegetation Survey, NREL South Table Mountain Site (NREL 2002)
- South Table Mountain Site Conservation Easement Baseline Inventory (NREL 1999)

Located at the base of the foothills to the Rocky Mountains, the STM site occurs at elevations ranging from 1,760 meters (5,780 feet) to 1,840 meters (6,030 feet) above mean sea level. This coincides with the interface between two ecological provinces: the Great Plains-Palouse Dry Steppe Province to the east, and the Southern Rocky Mountain Steppe – Open Woodland – Coniferous Forest – Alpine Meadow Province to the west (Bailey 1995).

Vegetation

With the exception of the second access road, the Proposed Action that is the subject of this ~~draft~~ SWEA/S-II would occur on NREL land with one predominant vegetation type. The construction that would occur as part of the Proposed Action would occur in Development Zones 4, 5, and 6 (see Figures 2-2 and 2-3), where the vegetation is mixed grass. Mixed grass vegetation makes up approximately 30 percent of the vegetation at the STM site.

Grassland and shrubland vegetation within proposed Corridors B, C and D is typical of the plains and foothill zones of the Front Range; however, these corridors are also bisected by riparian and wetland habitats associated with Lena Gulch and adjoining tributaries. Original vegetation primarily consisted of shrub-dominated (scrub) communities, grasslands (e.g., mid-grass prairie), and grasslands mixed with

shrubs. However, the project area corridors have been altered due to impacts from conversions, weed introductions, and irrigation activities. Additionally, alterations have occurred from the introduction of non-native grasses, such as crested wheatgrass and smooth brome, which have been seeded in disturbed areas to prevent erosion and provide forage. Lena Gulch is dominated by peach-leaved willow (*Salix amygdaloides*), crack willow (*Salix fragilis*), and cottonwood (*Populus deltoides*) trees along with scattered areas of wetland species, including Palustrine emergent, a wetland type that would typically support hydrophytic vegetation such as cattails (*Typha latifolia*), Nebraska sedge (*Carex nebrascensis*), slender sedge (*Carex praegracilis*), and Canada thistle (*Breea arvense*). An ecological assessment of areas including these corridors at Camp George West (Anderson & Company 1999a) provides additional details about the vegetation and ecology of Lena Gulch and surrounding areas.

Vegetation types associated with Corridor A (along Quaker Street) is limited to scattered trees, shrubs, and grasses typical of a suburban setting. Many single-family residences and multi-unit residences support gardens and lawns as well. Corridor E along Isabell Street is vegetated with scattered trees and grass varieties introduced when the area was populated with a mobile home park.

Wetlands

Wetlands exist along Lena Gulch within an area starting at South Golden Road and extending to Isabell Street. Figure 3-11 illustrates the results of a recent wetland delineation of the Lena Gulch area, including the proposed second access road corridors. On August 17, 2009, DOE sent a letter to the U.S. Army Corps of Engineers (USACE) requesting concurrence with the wetland boundaries shown on the map. The USACE concurred with the wetland mapping shown on Figure 3-11 on August 28, 2009. Previously (December 2008), DOE sent a letter to the USACE requesting a determination on whether existing nationwide permits apply to construction involving wetlands in Lena Gulch, and the USACE responded that, depending upon final route selection, nationwide permits could apply. These letters and the USACE responses are included in Appendix B. The Pleasant View Metropolitan District has previously re-contoured areas within Pleasant View Community Park in order to change the floodplain along Lena Gulch in preparation for park build-out plans. These activities are independent of NREL's plans proposed in this document. However, many of the newly constructed wetlands shown on Figure 3-11 are designed specifically for a water drainage system, and some locations serve as mitigation areas. Therefore, it is prudent to avoid these wetlands whenever possible.

Wildlife

Wildlife habitat at the STM site is almost exclusively grassland and shrubland. The Colorado Division of Wildlife (CDOW) has estimated that these habitats may support up to 14 reptile species, 36 mammal species, 82 bird species, and 4 amphibian species. A wildlife study of the STM was conducted in 1987.

The demographics of the area surrounding the STM site have changed since that study, and additional development of the STM site has since occurred. At the request of NREL, Science Applications International Corporation began a four-season wildlife survey of the STM site in the spring of 2004 to update the 1987 data. The 2005 wildlife survey (NREL 2005) is incorporated into this ~~draft~~ SWEA/S-II by reference. The wildlife survey also includes recommendations for consideration during normal site operations and future construction projects to minimize adverse impacts to wildlife. These recommendations would be reviewed and implemented to the fullest extent possible before and during implementation of the Proposed Action.

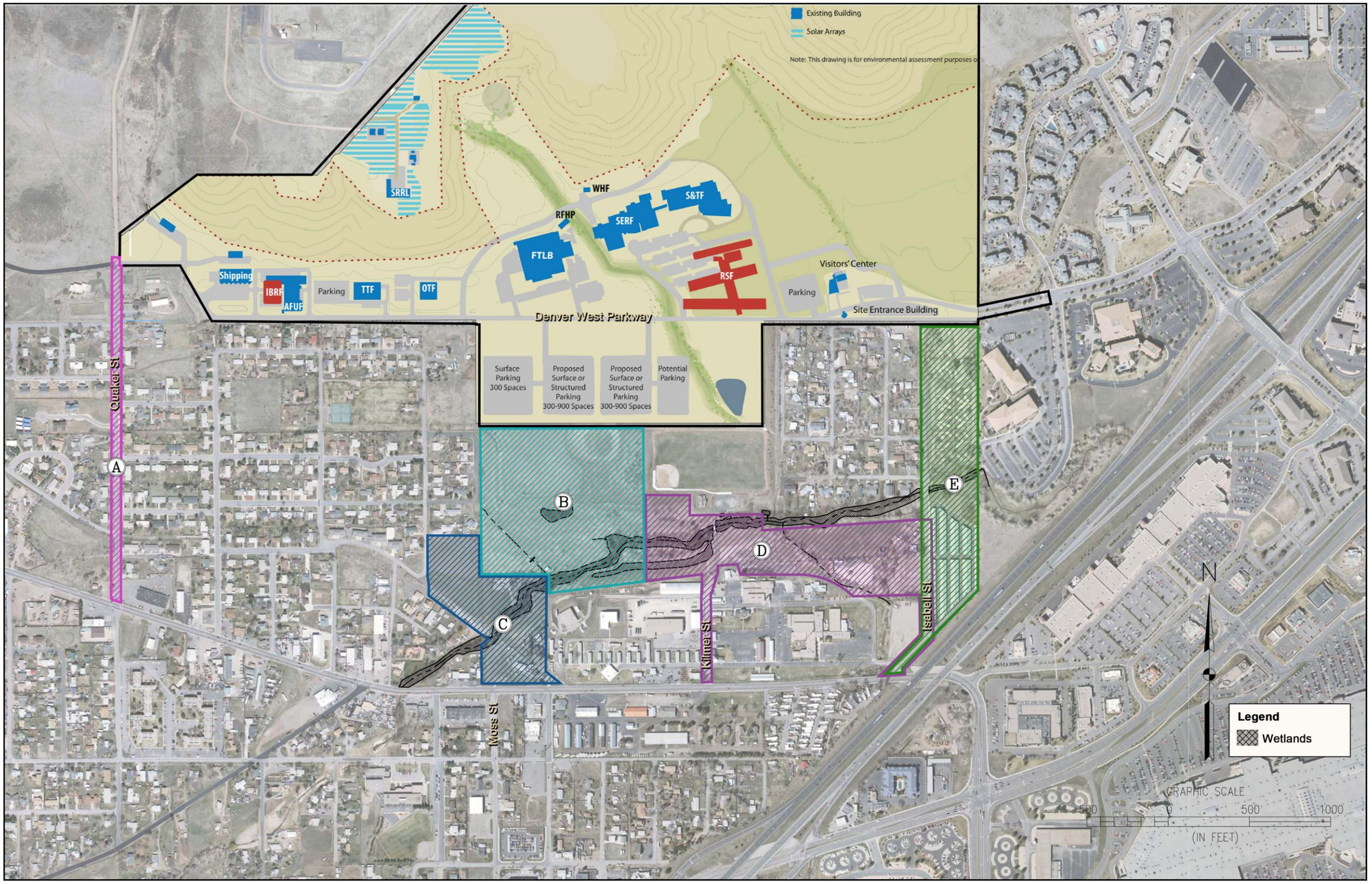

Figure 3-11. Wetlands Map of the Lena Gulch Area

Given its location within the landscape, Lena Gulch does not function as a high-quality wildlife corridor due to urban encroachment upstream of the proposed Corridors B, C, and D. In other words, Lena Gulch does not provide a quality connection for wildlife movement from the foothills given the urban encroachment and associated management of the drainage west of Pleasant View Community Park. However, Lena Gulch does serve as an important watering area and as shelter, especially for mule deer does with fawns. Mule deer regularly travel from South Table Mountain to Lena Gulch as observed by local residents.

Species of Concern

For this ~~draft~~ SWEA/S-II, a species of concern is defined as those species protected under federal statute, including the Endangered Species Act of 1973, as amended; the Bald Eagle Protection Act of 1940, as amended; and the CDOW list of endangered, threatened, and wildlife species of concern. Federal agencies are also required to abide by the Migratory Bird Treaty Act of 1918, as amended.

The 2005 survey included a review of the U.S. Fish and Wildlife Service (USFWS) list of proposed, endangered, threatened, experimental, and candidate species and habitat and the CDOW list of endangered, threatened and wildlife species of special concern for species observed on the STM site. No species observed on the STM site during the 1987 or the 2004-2005 wildlife surveys were present on either agency's list. However, golden eagles were incidentally observed on the STM site (outside of raptor surveys) and are protected under the Bald Eagle Protection Act. Golden eagles were observed flying over the site and may use the site for hunting. No golden eagle nests or nesting activities were observed on the STM site. During the 2009 nesting season, a red-tailed hawk was observed along Lena Gulch, and a raptor nest was also observed. Although the hawk was not observed at the nest, the nesting season was ending (CDOW 2008); it is assumed that the nest was associated with the hawk.

The USFWS lists two threatened plant species—the Ute ladies' tresses orchid (*Spiranthes diluvialis*) and the Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*)—and the threatened Preble's meadow jumping mouse (*Zapus hudsonius preblei*) as protected species that may potentially occur in the Lena Gulch area. However, field surveys completed in 2009 (see letters to USFWS in Appendix B) did not observe the Ute ladies' tresses or Colorado butterfly plant on the project site or in the proposed access road corridors. Although suitable hydrologic conditions exist at Lena Gulch and in the lower reaches of various upslope drainageways, only two species commonly associated with Ute ladies' tresses occurred. In addition, a field survey completed in 1999 did not observe the Ute ladies' tresses on the project site or in the proposed access road corridors, and soils identified during the survey generally did not appear conducive to the establishment of the species (Anderson & Company 1999b). Ecological conditions for the Colorado butterfly plant were marginal along Lena Gulch, and this plant species has very limited populations. It was not expected to be found, but the 2009 survey was conducted to be thorough. As stated earlier, no Colorado butterfly plants were found.

A habitat assessment for the Preble's mouse was conducted according to USFWS guidelines (USFWS 2004). Any project within 300 feet of the 100-year floodplain within associated Front Range counties in Colorado must consider impacts to Preble's mouse habitat. A few locations have been cleared in blocks so that projects within the clearance zones do not need to consider impacts to this mouse. The Denver Urban Drainage Block Exclusion Zone does not extend to Lena Gulch until it passes under I-70. Therefore, a habitat assessment for Lena Gulch was required. A trapping survey completed in 1999 (Kane 1999) did not capture any Preble's mice. After conducting the assessment and reviewing past trapping efforts, biologists recommend that the area along Lena Gulch be disqualified as habitat for the Preble's mouse. The USFWS concurred with the assessment findings (Appendix B). Although the USFWS typically requires multiple trapping surveys before removing a site from consideration, the low-

quality habitat and the unsuccessful trapping effort supported the recommendation that Lena Gulch be disqualified as habitat for this mouse. No populations exist nearby or at Lena Gulch.

Regulatory Background and Agency Consultations

The Proposed Action falls under the jurisdiction of the USFWS. The Clean Water Act, Section 404, falls under the jurisdiction of the USACE. The USACE provided concurrence on the wetland delineations and associated mapping of the Lena Gulch area on August 28, 2009 (Appendix B). Based on previous discussions, USACE indicated that impacts to wetlands associated with a final design of a road crossing would likely be covered under a Nationwide Permit #14.

Reports documenting the Preble's mouse habitat assessment and the rare plants survey (i.e., the Ute ladies' tresses orchid and the Colorado butterfly plant) were sent to the USFWS (Appendix B). On August 20, 2009, DOE received a~~A~~ letter from the USFWS concurring with the findings of the habitat assessment ~~was received by DOE on August 20, 2009~~from USFWS. DOE ~~recieved~~received ~~C~~concurrence on the findings of the plants survey ~~was received by DOE~~ on September 24, 2009.~~are still pending~~~~The USACE provided concurrence on the wetland delineations and associated mapping of the Lena Gulch area on August 28, 2009 (Appendix B). Based on previous discussions, USACE indicated that impacts to wetlands associated with a final design of a road crossing would likely be covered under a Nationwide Permit #14.~~

3.1.6.2 Impacts of the Proposed Action

The proposed projects on the STM site would be located largely on undeveloped land. Land clearing, excavation, construction, and paving would clear approximately 6 hectares (15 acres) of land suitable as habitat for wildlife or for any vegetation other than noxious weeds. The construction access road developed for the RSF, will become a permanent part of the site infrastructure, and access for the ESIF construction activities for up to two years. There would be no difference in the impacts to native vegetation between the two proposed ESIF locations.

A proposed second access road would permanently convert native grassland and riparian vegetation, including some wetlands into a roadway.

- Corridor A – approximately 0.4 hectare (1.0 acre) of mostly non-native, residential vegetation would be converted into a ROW.
- Corridor B – approximately. 0.4 hectare (1.0 acre) of natural vegetation would be converted into a ROW, and either a new crossing or modification of the existing crossing over Lena Gulch would be required.
- Corridor C – approximately 0.4 hectare (1.0 acre) of natural vegetation would be converted into a ROW, and either a new crossing or modification of the existing crossing over Lena Gulch would be required.
- Corridor D – approximately 0.8 hectare (2.0 acres) of natural vegetation would be converted into a ROW, and either a new crossing or modification of the existing crossing over Lena Gulch would be required.
- Corridor E – approximately 0.5 hectare (1.3 acres) of mostly non-native, residential vegetation would be converted into a ROW.

For Corridors B, C, D and E, less than 0.07 hectare (0.1 acre) of wetland habitat could be affected while crossing Lena Gulch. However, it should be noted that wetland vegetation occurs primarily within Corridors B, C, and D. Depending upon the final route location, considerably more wetland area could be disturbed if Corridor D were selected than if Corridor B or C were selected. Corridor A is devoid of wetlands, and Corridor E encompasses a comparatively small amount. Pending approval through a FONSI, DOE would use this document to select among the corridor alternatives but would not select a specific route within a corridor without further analyses and consultations with CDOW regarding minimizing or mitigating wildlife impacts.

Land clearing would destroy or disturb existing native vegetation, making the areas more susceptible to noxious weeds. Noxious weeds such as Canada thistle, diffuse knapweed, musk thistle, houndstongue, field bindweed, common teasel, jointed goatgrass, and dalmatian toadflax occur on the site and are found on either the list of the 10 most widespread noxious weeds in the State of Colorado or on Jefferson County's list of noxious weeds of concern. The potential spread of these species, as well as cheatgrass and 12 other noxious weed species found at the STM site, into disturbed areas represents secondary impacts as a result of the Proposed Action. NREL has made efforts to combat noxious weed invasion. These efforts include implementation of a noxious weed management plan which, among other strategies, calls for a native grassland seed mix to be used in restoration areas after construction and application of herbicides or mowing to control weeds in areas identified as having noxious weed infestations.

Build out of the facilities and infrastructure under the proposed action would not create an impassible barrier to the movements of wildlife from the mesa top to Lena Gulch.

3.1.7 Cultural Resources

3.1.7.1 Existing Environment

There are no known significant prehistoric archeological resources within or adjacent to the NREL STM property. There are no known significant traditional cultural resources within or adjacent to the STM site. Should any evidence of archeological or cultural resources be discovered during any ground-disturbing activities at the STM site or within the Camp George West Historic District, all work would stop in the vicinity until a qualified archeologist evaluated the significance of the find according to NRHP criteria.

Development of a second access road along Corridors B, C, and D would occur within the boundaries of the Camp George West Historic District. This district was deemed eligible for NRHP listing by the SHPO as part of the determination of eligibility for the larger Camp George West complex. The complex, in its entirety, is defined by the boundaries of all lands historically utilized by the Colorado Army National Guard for its activities at the Camp George West installation. The registered district is listed based on historical significance and association with the military development of the area during a portion of World War I and the duration of World War II. The district, also known as the "State Rifle Range," includes portions of the former Colorado Army National Guard complex located south of Denver West Parkway. The range was used during World War I and World War II for intense training, target practice, marching, tank operation, and tactical exercises.

The boundaries of the historic district relative to the STM site and the locations of several historic structures in the area are shown in Appendix D, Figure D-1. Historic resources that could be affected by a second access road are shown on Figure D-2. DOE has reviewed the information available from the NRHP on the Camp George West Historic District and has determined that 13 listed structures that contributed to the district's designation (called contributing resources) and two noncontributing resources occur in or near Corridors B and D. Table 3-4 lists these resources and the corridor in which each occurs.

Corridors A, C and E are devoid of any known historic resources. A more detailed characterization of the potentially affected historic resources and current photographs of each resource are provided in Appendix D.

Table 3-4. Historic Resources in or near Corridors B and D

Resource Number	Description	Corridor	
		B	D
Contributing Resources			
12	Mess Hall	No	Yes
28	Mess Hall	No	Yes
29	Mess Hall	No	Yes
33	Small Arms/Ammunition Storage	No	Yes
45	Headquarters	No	Yes
48	Recreation Hall	No	Yes
49	Swimming Pool[a]	No	Yes
50	Pedestrian Underpass	No	Yes
83	Guardhouse	No	Yes
84	Pump House[a]	Yes	No
92	Bridge	Yes	No
113	Bridge	No	Yes
FR12	Firing Lines	Yes	No
Noncontributing Resources			
104	Golden Gun Club Clubhouse[b]	Yes	No
111	Motor Vehicle Warehouse	No	Yes
Total Number of Resources		4	11

a. No evidence of this resource could be found during field surveys in October 2008.
b. Structure was destroyed by fire in July 2009.

3.1.7.2 Regulatory Background and SHPO Consultations

SWEA/S-I addressed the impacts to the northern-most firing lines and the low rock walls within the STM site that would occur from the establishment of new parking lots in this area and also summarized the mitigation measures that were agreed to between DOE and the SHPO.

SHPO consultations are ongoing relative to the new Proposed Action and are documented in Appendix B. A search of the state's databases identified the resources noted in this text and in Appendix B.

3.1.7.3 Impacts of the Proposed Action

The proposed facilities and infrastructure improvements in Zones 4, 5, and 6 would occur in areas that have been surveyed and where no cultural or historic resources are known or believed to exist. No impact to cultural or historical resources is anticipated. However, if, during the course of construction, any cultural or historic resources were discovered, work in that area would be immediately halted pending consultations with a qualified state or tribal archeologist or historian and, if necessary, the SHPO.

Construction of a second access road within Corridors B and D could result in adverse impacts to some historical resources within the Camp George West Historic District, depending upon the location of the

final route. However, most resources could be avoided by careful route location. Road construction in Corridors A, C, and E would not affect any historic resources.

If a FONSI results from this SWEA/S-II, DOE would use this document to select among the corridor alternatives but would not select a specific route within a corridor without further analyses and consultations with the SHPO. Therefore, no formal determination of effect under Section 106 of the National Historic Preservation Act (NHPA), as amended (16 U.S.C. 470f), and implementing regulations codified at 36 CFR Part 800, has been made, nor has Historic American Building Survey/Historic American Engineering Record (HABS/HAER) documentation been prepared. If DOE's corridor selection and subsequent route evaluation suggested that historic resources would be impacted, DOE anticipates that a Memorandum of Agreement (MOA) would be established with the SHPO (similar to the MOA established previously) that would stipulate the process for assessing and mitigating impacts to historic resources.

3.1.8 Air Quality

National Ambient Air Quality Standards (NAAQS) set upper concentration limits for six air pollutants in order to protect human health. These six pollutants, called criteria air pollutants, are carbon monoxide (CO), nitrogen oxides (NO_X), ozone (O_3), particulate matter (PM), sulfur dioxide (SO_2), and lead (Pb). Geographic areas that currently exceed or have recently exceeded the limit for one or more of the criteria air pollutants (or for O_3 precursors) are called nonattainment areas or maintenance areas. The two O_3 precursors are VOCs and NO_X.

3.1.8.1 Existing Environment

Detailed descriptions of the existing air quality at the STM are provided in the SWEA. Those descriptions address climate (Section 3.3.1), air quality regulatory authorities (Section 3.3.2), emissions sources (Section 3.3.3), and STM site permit status (Section 3.3.4). They remain generally current and are summarized or updated below.

The STM site has numerous stationary sources of air emissions, including boilers, water heaters, back-up generators, and building heaters. Table 3-5 shows the STM site's potential to emit four criteria air pollutants—PM, SO_2, NO_X, and CO—and provides estimated annual emissions of those pollutants. In addition, with respect to hazardous air pollutants, the STM site emits extremely small quantities of materials from laboratory hoods. Examples of these hazardous air pollutants include aliphatic and aromatic hydrocarbons, chlorinated and non-chlorinated compounds, inorganic acids, alcohols, and noble gases. The emission quantities are below notification and permit thresholds. Fugitive emissions also can occur from the STM site as unplanned emissions from miscellaneous routes other than stacks, chimneys, or vents. These emissions are minor. Construction activities at the STM site have the potential to increase fugitive dust levels by disturbing soil.

Table 3-5. STM Site Estimated Annual Air Pollutant Emissions

Type of Air Emission	Particulates	SO_2	NO_x	CO
	Tons per Year (TPY)			
Potential	7.96	5.76	51.61	24.61
Estimated[a]	4.41	0.59	9.35	4.97

a. Includes projected emissions from Renewable Fuel Heating Plant, which was assessed in DOE 2007 and began intermittent operations in late 2008.
Sources: NREL 2001, as updated for 2007.
DOE 2007.

3.1.8.2 Impacts of the Proposed Action

This section discusses general construction- and operations-related impacts to air quality that would occur under the Proposed Action. Section 3.1.8.3 (Conformity Review) discusses criteria air pollutant emissions attributable to the Proposed Action in further detail.

Construction activities associated with the proposed projects would cause a temporary increase in emissions of criteria air pollutants from construction equipment exhaust emissions. Construction of the proposed second access road, new parking lots, and service roads and installation of underground utilities would involve scraping and grading, which would result in intermittent fugitive dust emissions during construction. Dust would be managed in accordance with NREL's existing Particulate Emissions Permit for Construction Activities issued by the Colorado Department of Public Health and Environment (CDPHE).

Air emissions from the proposed ESIF operations and from the Visitors Center and WHF expansions would be limited to those characteristic of heating, ventilation, and air conditioning (HVAC) equipment, similar to the operating emissions from other NREL research buildings and would be well below current permit limits. The WHF is short-term (less than 90 days) storage facility, and containers are maintained in a closed condition. However, during packaging activities, small quantities of organic solvents containing VOCs are consolidated into larger packages. During this process, containers are opened for brief periods and would emit extremely small quantities of air pollutants. Because construction-related emissions would be short-term, and operational emissions would be small, no adverse health impacts to on-site workers or the public or adverse visual impacts to the local or regional viewshed would result from air emissions due to the proposed construction, building expansions, and site infrastructure improvements.

3.1.8.3 Conformity Review

Section 176(c)(1) of the Clean Air Act requires that federal actions conform to applicable state implementation plans (SIPs) for achieving and maintaining the NAAQS for the criteria air pollutants. In 1993, the EPA promulgated a rule titled "Determining Conformity of General Federal Actions to State or Federal Implementation Plans" (58 Fed. Reg. 63214 (1993), codified at 40 CFR Parts 6, 51, and 93. The "conformity rule" is intended to ensure that emissions of criteria air pollutants and their precursors are specifically identified and accounted for in the attainment or maintenance demonstration contained in SIPs. For there to be conformity, a federal action must not contribute to new violations of air quality standards, increase the frequency or severity of existing violations, or delay timely attainment of standards in areas of concern.

The conformity rule applies to non-exempt, federal actions that would cause emissions of criteria air pollutants (or their precursors) above EPA's established threshold levels (de minimis levels) in designated nonattainment or maintenance areas. Under the rule, an agency must engage in a *conformity review* and, depending on the outcome of that review, conduct a *conformity determination*. In a conformity review, the federal agency must (1) determine whether a proposed action would cause emissions of criteria pollutants or their precursors, (2) determine whether the emissions would occur in a nonattainment or maintenance area for any of the criteria air pollutants, (3) determine whether the proposed action is exempt from the conformity rule requirements, (4) estimate the emission rates of criteria air pollutants impacting a nonattainment or maintenance area, and (5) compare the estimate to the applicable threshold emission rates. If the estimated emission rates are below the threshold, the proposed action is assumed to conform and no further action is required. If they exceed the threshold, a more detailed conformity determination is required.[2]

DOE conducted a conformity review for the Proposed Action and determined that (1) the Proposed Action would result in emissions of criteria air pollutants, and (2) these emissions would occur in an area (Jefferson County, Colorado) that the EPA has designated as a moderate nonattainment area for O_3 and a maintenance area for CO and PM. Consequently, DOE conducted a further review of estimated emissions of these criteria air pollutants to determine the applicability of the general conformity rule and to determine if the estimated rate of these emissions would be less than or greater than the allowed thresholds.

The threshold emission rates for a moderate O_3 nonattainment area is 100 tons per year (TPY) of NO_X or VOC; the threshold emission rates for CO and PM in a CO or PM maintenance area are also 100 TPY (40 CFR 93.153).

Operational Emissions

Operation of the proposed ESIF facility would likely result in increased emissions of VOCs (e.g., acetone, cyclohexane, toluene, xylene, and similar volatile organics) and criteria pollutants (CO, O_3, PM, NO_X, and SO_2). At either alternative location for the ESIF, eEmission sources associated with the proposed operations of ESIF research equipment would include: four diesel fired gensets and one diesel-fired backup generator. Worst-case criteria air emission calculations (i.e., potential to emit) prepared for these new air emission generators are expected to be: CO: 16.81 TPY; NO_X: 65.19 TPY; PM: 2.43 TPY; and SO_2: 18.03 TPY.

These emission totals are lower than the 100-TPY potential-to-emit threshold for Major Source designation; therefore, they would be expected to be below thresholds for notification of conformity review and permitting and, as such, would not require modeling. As specific information became available regarding equipment size, fuel type, and runtime, a notification and permitting determination would be made considering activity-specific and cumulative emissions.

As discussed previously, the build-out of the STM site would result in an increased number of employees and, therefore, increased emissions from more vehicles entering and leaving the STM site. At the STM site these mobile sources individually would operate only briefly during the morning and evening commutes, and collectively, because of the planned traffic management measures, would be spread over

[2] Previously, a conformity review would also entail comparing estimated emissions in a nonattainment or maintenance area to regional inventories to ensure that estimated emissions were not "regionally significant". However, in its proposed revision to the general conformity rule (73 FR 1402; January 8, 2008), EPA proposes to delete the requirement in 40 C.F.R. 93.153(i) relating to regionally significant actions in part because in more than 12 years since promulgation of the existing regulations, no action has been determined to be regionally significant.

2.5 hours each morning and evening allowing dispersion of vehicle emissions. Emissions from commuting workers are exempted from the conformity review requirements under several provisions of 40 CFR 93.153(c)(2), however, the proposed action of adding a second access road to the STM site would reduce the idling time at the STM site, as thus the emissions, from that which would occur if the Denver West Parkway were the only entrance and egress from the site.

In the Denver area, there are about 52,736,000 miles of vehicle travel daily (DOT 20089). Vehicles traveling to and from the STM site, including commuting workers, would travel about 75,600 miles daily. This represents about a 0.14 percent increase in the regionaldaily traffic, or less than 1 percent. Due to nearby development such as the Colorado Mills shopping center, traffic in the area has increased 3 to 4 percent in recent years and is expected to increase by about 1 percent per year in the future (FHU 2008).

Studies have found that chronic exposure to traffic-related air pollution may contribute to premature mortality (Jerrett et al. 2009). However, these studies usually examine relatively large increases in exposure to traffic-related air pollution (about 20 percent), so it is unlikely that a 0.14 percent increase in traffic would result in an increase in observable adverse health effects.

Construction Emissions

Construction associated with the Proposed Action would result in localized, short-term increases in ambient concentrations of CO, NO_X, and PM. These emissions would result from operation of construction equipment engines and from fugitive dust suspended during earth moving and grading, material handling and storage, and construction equipment and vehicles traveling over temporary dirt and gravel access roads. Given the small area of the proposed construction sites, the proximity to paved roads, and the anticipated short duration of the construction, potential impacts to the local air quality environment would be local and temporary. Construction impacts would be minimized through the use of best management practices (BMPs), such as wetting the soil surfaces, covering trucks and stored materials with tarps to reduce windborne dust, limiting freeboard on material haul vehicles, and using relatively late-model, properly maintained construction equipment.

Emissions of construction-generated fugitive dust would be permitted under NREL's CDPHE Air Permit #08JE0889L, which authorizes emissions of fugitive dust at the STM site associated with overlot grading and associated construction activities. The general conformity rule (40 CFR 93.153(d)) provides an exemption for portions of an action that require an air emissions permit because state-permitted emissions are presumed to conform to the applicable SIP. DOE has determined that because PM emissions from construction-generated fugitive dust would be permitted under CDPHE Permit # #08JE0889L, they are exempt from the need for further conformity determination.

The Proposed Action also includes construction activities that would result in emissions of CO, NO_X, and PM primarily from diesel engines. EPA has published exhaust and crankcase emission factors for steady-state emission of CO, NO_X, and PM from off-road diesel engines (EPA 2004). Table 3-6 shows these emission factors for Tier 1 engines of various power ranges. Tier 1 standards were adopted in 1994 for engines over 50 horsepower (hp) and were phased in from 1996 to 2000.

Table 3-6. Tier 1 Steady-State Emission Factors for Nonroad Diesel Engines

Engine Power (hp)	Tier 1 Technology-Type Emission Factors (g/hp-hr)		
	CO	NO_x	PM
>50-75	2.3655	5.5988	0.4730
>75-100	2.3655	5.5988	0.4730
>100-175	0.8667	5.6523	0.2799
>175-300	0.7475	5.5772	0.2521
>300-600	1.3060	6.0153	0.2008

Note: hp = horsepower; g/hp-hr = grams per horsepower-hour.
Source: EPA 2004.

The exact types and numbers of engines that would be used for the Proposed Action and their total hours of operation are not yet known. However, based on a review of recent, similar construction projects at the STM site and at other DOE sites, DOE developed a list of the types and sizes (horsepower ranges) of equipment (Table 3-7). This equipment is believed to be representative of the equipment that would be used for the Proposed Action. Table 3-7 also shows DOE's estimate of the hours that each type of equipment would operate during the Proposed Action. The emission factors shown in Table 3-6 were applied to develop the estimates of the annual emissions of NO_X, CO, and PM shown in Table 3-7.

The estimated annual emissions of each of these criteria air pollutants are well below the 100-TPY thresholds. Moreover, DOE believes these estimates are conservative for the following reasons: (1) the calculations assume the highest engine horsepower shown in a given engine size range, (2) the calculations assume Tier 1 technology, and at least some of the equipment used would probably employ more stringent (lower-emitting) Tier 2 through 3 technology, and (3) the estimates of operating hours are conservatively high.

Because the estimated emissions of CO, NO_X, and PM from construction activities would be below the de minimis thresholds, DOE has determined that further conformity determination is not required. DOE acknowledges that there would likely be additional miscellaneous sources of CO, NO_X, and PM directly or indirectly attributable to the Proposed Action (for example, commuting construction workers and the use of equipment types not specifically identified in Table 3-7). While recognizing and acknowledging these potential additional incremental sources, DOE believes they would not result in the Proposed Action exceeding allowed threshold levels because they would be either short-term (commuting workers) or limited in their potential to emit.

3.1.9 Geology and Soils

3.1.9.1 Existing Environment

The detailed descriptions of the site geology and soils found in the SWEA remain current and are summarized below.

The STM is located on the gently sloping terrain of the Foothills Province of the Rocky Mountain Front Range between the Southern Rocky Mountain Province to the west and Great Plains Province to the east. Denver clay loam and Denver cobbly clay loam dominate the soils at STM site where the proposed new facilities would be constructed. The STM site is classified as being in Seismic Zone 1, an area of low seismic risk. Structures to be built on the STM site would meet the most current Uniform Building Code standards appropriate for its designated seismic zone.

3.1.9.2 Impacts of the Proposed Action

Potential geological impacts would closely resemble the geological impacts presented in the SWEA, which specifically considered construction of the S&TF and other comparable site developments. Prior to construction, the new construction areas would be excavated and graded as needed. Materials such as concrete aggregate and crushed rock would be required during construction. These materials would be obtained from off-site commercial sources or may involve use of material from on-site excavations. Excavation may occur below the alluvial surface. Excavation could conceivably go below the alluvium if reaching bedrock for stability were necessary. It is unlikely that any construction associated with the Proposed Action would increase landslide potential anywhere on the STM site because there is no evidence of recent landslides on the south side of STM, and no on-site or off-site construction in the immediate vicinity of the STM site has caused slope instability.

Table 3-7. Estimated CO, NO_X, and PM Emissions from Diesel Construction Equipment

Major Construction Source	No. of Units	Engine Size Range (hp)	Total Operating Hours/Yr	Estimated Annual Emissions (TPY)		
				CO	NO_x	PM
Portable Lighting Units	3	50-100	254	0.07	0.16	0.01
Portable Generator	1	50-100	170	0.04	0.10	0.01
Backhoe/Loader	3	50-100	1,661	0.43	1.03	0.09
Forklift	3	50-100	2,563	0.67	1.58	0.13
Asphalt Paver	1	100-175	213	0.04	0.23	0.012
Asphalt Roller	1	100-175	213	0.04	0.23	0.012
Vibratory Compactor	2	100-175	427	0.07	0.47	0.02
Concrete Pumper	3	100-175	256	0.04	0.28	0.01
Water Tanker	1	100-175	384	0.06	0.42	0.02
Excavator	2	100-175	768	0.13	0.84	0.04
Bulldozer	2	100-176	768	0.19	1.42	0.06
Motor Grader	2	175-300	768	0.19	1.42	0.06
Wheel Loader	3	175-300	1,152	0.28	2.12	0.10
Crane – 35-ton	2	175-300	555	0.14	1.02	0.05
Concrete Truck	2	175-300	339	0.08	0.63	0.02
Scraper	2	300-600	768	0.66	3.06	0.10
Dump Truck	4	300-600	1,537	1.32	6.11	0.20
Crane – 50-ton	2	300-600	171	0.15	0.68	0.02
		Total Estimated Emissions (TPY)		**4.60**	**21.79**	**0.99**
		De Minimis Threshold (TPY)		**100**	**100**	**100**

Note: hp = horsepower
TPY = tons per year
yr = year

3.1.10 Waste Management

3.1.10.1 Existing Environment

The descriptions of the existing waste management environment found in the SWEA remain generally current and are summarized or updated below.

The STM generates a variety of hazardous and nonhazardous wastes from laboratory and mission support activities (Table 3-8). All waste-handling and disposal activities comply with the requirements and regulations of the Occupational Safety and Health Act (OSHA), the Resource Conservation and Recovery Act, DOE, and the CDPHE. All hazardous wastes are packaged and disposed of through contracted off-site commercial treatment, disposal, and recycling firms. Many of the hazardous wastes generated on-site are recycled in accordance with CDPHE regulations, including such items as batteries, fluorescent bulbs, and computer monitors. As a BMP, many of the nonhazardous waste materials (nonregulated waste) generated at the sites are treated in the same manner as the hazardous wastes. These materials, although not classified as hazardous, are also recycled or disposed of at off-site commercial treatment, storage, disposal, and recycling facilities.

Table 3-8. Hazardous Waste Generation, 2003-2009

	Amount Generated (gross weight in pounds)						
	CY03	**CY04**	**CY05**	**CY06**	**CY07**	**CY08**	**CY09**
STM Site	18,627	18,124	41,948	17,187	22,280	15,700	15,008

Note: To convert pounds to kilograms, multiply by 0.45.

The WHF serves as a central consolidation point for hazardous, non-hazardous, radioactive and universal waste items that are generated throughout the STM site. The building is secured with controlled, limited access and is engineered to segregate individual waste items in order to prevent the comingling of incompatible materials. Additionally, the building houses its own ventilation and fire suppression systems inspected annually by West Metro Fire Department in conjunction with their issuance of site-specific hazardous materials storage permits. NREL security staff routinely and randomly patrols all facilities on the site to monitor for abnormal and off-normal conditions. The site maintenance program requires mowing of areas adjacent to buildings and equipment to provide a fire break zone in the event of a wildfire.

Recent volumes of hazardous wastes that have been handled at the WHF (by calendar year) are summarized below. During the period January 2009 through August 2009, eight waste shipments have occurred at the STM facility.

Historically, NREL has been a small-quantity waste generator, which means that the facility has generated more than 100 kilograms (220.5 pounds) but less than 1,000 kilograms (2,205 pounds) of hazardous waste per month. However NREL anticipates that it will become a large-quantity generator as early as 2010. Large-quantity generators generate more than 1,000 kilograms (2,205 pounds) of hazardous waste, or more than 1 kilogram (2.2 pounds) of acutely hazardous waste, per month.

The STM site does not maintain an on-site waste disposal facility. Waste is shipped to licensed off-site disposal facilities.

3.1.10.2 Impacts of the Proposed Action

ESIF Construction, Visitors Center and WHF Expansions, and Site Infrastructure Improvements including a Second Access Road

Construction would be short-term (less than 24 months) and would not substantially increase the amounts or types of waste generated or temporarily stored at the site. In the case of a spill or release of chemicals or hydrocarbons during construction activities, existing BMPs and procedures associated with spill response and materials handling would minimize impacts to surface water and soils. These procedures are defined in the NREL *Spill Prevention Control and Countermeasures (SPCC) Plan* for the STM (Procedure 6.2-10) and the NREL *Stormwater Pollution Prevention for Construction Activities: STM* (Procedure 6-2.15) (NREL 2006). Any construction debris that could not be recycled would temporarily increase the weight and volume of nonregulated waste generated at the site.

In support of DOE's goal to demonstrate energy-efficient buildings with a lower impact on the environment, the facility would be designed to merit at least a LEED "Gold" rating from the U.S. Green Building Council, which would be the highest-certified facility of its type. At least 10 percent of the total value of materials used in construction projects is to contain recycled content. At least 10 percent of the total value of the materials and products used in the project is required to be manufactured regionally within an 800-kilometer (500-mile) radius of NREL. At least 50 percent of construction debris is to be recycled.

ESIF operations could generate small quantities of hazardous waste and nonregulated waste, which would be disposed of off-site at existing commercial facilities. Even though waste volumes would grow, neither construction nor operational wastes from the Proposed Action would result in any new impacts to off-site waste treatment, storage, or disposal facilities that currently handle NREL wastes.

3.1.11 Noise

3.1.11.1 Existing Environment

Detailed descriptions of the existing noise environments at the STM are provided in the SWEA. These descriptions address sensitive noise receptors (Section 3.4.1), existing noise levels (Section 3.4.2) and noise regulations and guidelines (Section 3.4.3). They remain current and are summarized below.

Noise receptors located in the immediate vicinity of the STM site include STM personnel; inhabitants of residences east, west, and south of the site boundary; and wildlife. With respect to NREL personnel, DOE has accepted the OSHA noise regulations and guidelines for worker exposure and manages compliance with them. These regulations and guidelines focus on noise from machinery, equipment, and tools. DOE maintains compliance with all regulations related to worker health and safety.

Receptors in the vicinity of the site include inhabitants of multi-family residences located approximately 15 meters (50 feet) east of the site boundary. Two subdivisions consisting of single-family residences are located south and west of the STM site. The nearest residence to the site's southwestern boundary is located approximately 15 meters (50 feet) away. The nearest residence to the site's southeastern boundary is located approximately 30 meters (100 feet) away. The nearest school, church, or day-care center is about one-half mile from the site, near 20th and Denver West Parkway. The partially completed regional park, Pleasant View Community Park, is being established in the open area south of Zone 6.

Within the corridor alternatives for the proposed second access road, noise receptors vary in number and proximity to any potential route. All receptors are currently affected by the ambient traffic noise generated by South Golden Road and I-70.

Although noise measurements were not taken for the SWEA and noise modeling was not performed, site observations indicate that the acoustic environment within the boundaries of the southeastern portion of the site can be considered similar to that of an urban location. I-70 is a significant noise source throughout the day and during sensitive late-night and early-morning periods. It is estimated that 24-hour day-night average sound levels on the site typically range from 40 to 60 A-weighted decibels (dBA). Most activity and mechanical operations at the STM site are conducted within buildings.

3.1.11.2 Impacts of the Proposed Action

The State of Colorado Noise Statute (Code of Colorado Regulations [CCR] 25-12-101 through CCR 25-12-109) has established state-wide standards for noise level limits for various time periods and areas. These standards can be used as guidelines for evaluating impacts. The most stringent permissible noise levels apply to residential zones, where the maximum permissible daytime (7 AM. to 7 PM) noise level is 55 dBA measured at a distance of 8 meters (25 feet) from the property line. In addition, construction projects are limited to permit conditions or 80 dBA for the period within which the construction is to be completed or a reasonable amount of time.

Facility Construction

Construction would normally occur Monday through Friday during daylight hours. ~~The~~ An exception would be in cases where construction activity required interruption of site utility services; in that case, weekend work may occur. There would be a short-term (approximately 24 months) increase in ambient noise due to construction of the project facilities. Heavy equipment such as bulldozers, graders, backhoes, excavators, dump trucks, and cement trucks would generate noise that would impact on-site workers and nearby residents, especially residents living immediately east and west of the project site. Construction equipment typically emits noise in the 86- to 94-dB range. Construction workers would use hearing protection and would follow OSHA standards and procedures. Direct exposure of NREL staff to construction noise would be generally limited to times when personnel were outdoors walking to or from parked vehicles or between buildings.

Construction activities near the east or west boundary of the project site would occur close to residences, and noise could be a nuisance for some residents during construction. Construction-related noise impacts would vary with the phase of construction and would occur intermittently.

Second Access Road Construction

Roadway construction along any of the proposed corridors would take 2 to 3 months and would utilize heavy equipment similar to that needed for building construction on the STM site.

Corridor A

Construction noise would affect ambient noise levels of as many as 15 adjacent residences (sensitive receptors) adjacent to Corridor A. Noise emissions are expected to occur over a 2- to 3-month period. Noise generated by roadway construction equipment, including material handlers, pavement machines, and equipment to construct curb and gutter portions of the roadway, can reach levels exceeding 65 dBA (EPA 1971). Typical operating cycles may involve 2 minutes of full power, followed by 3 or 4 minutes at

lower settings. Although noise ranges were found to be similar for all construction phases, in general, noise levels would vary from 79 dBA to 88 dBA at 15 meters (50 feet) during construction. Based on these estimates, and assuming noise from construction activities would attenuate rapidly from source to receptor, construction noise would not be considered adverse. Moreover, these noise emissions would be experienced for a relatively short duration and would comply with all applicable noise ordinances.

Corridor B

Construction noise associated with Corridor B would affect ambient noise levels for as many as six residences to the west of the site along Moss Street and for a number of nearby receptors in proximity to this corridor. Similar to the discussion for Corridor A, noises from source to receptor are expected to attenuate rapidly.

Corridor C

Construction noise associated with Corridor C would affect ambient noise levels for two residences in proximity to this corridor. Similar to the discussions above for Corridors A and B, noises from source to receptor are expected to attenuate rapidly.

Corridor D

Construction noise associated with Corridor D would affect sensitive receptors residing or working within the State of Colorado property. Depending upon the need to modify Kilmer Street, the inmates of the nearby correctional institution and workers in the CDOT and State Highway Patrol buildings would be affected by construction noise.

Corridor E

Construction noise associated with Corridor E would be audible from nine residences to the west of the corridor along Isabell Street.

Facility Operations

The proposed ESIF would be an office building and a research and development facility, not a manufacturing facility. Noise sources associated with the ESIF would include the intermittent operation of four to seven hydrogen or diesel-fired gensets and a backup generator.

Final selection of specific gensets and a generator has not been made; however, based on available manufacturer information, noise levels associated with this equipment are expected to be approximately 80 dBA at a distance of 6 meters (20 feet).

Levels of ambient or intrusive outdoor noise vary extensively at distances greater than about 90 meters (300 feet) from the source. This variation is caused by changes in weather and by topographical features, structures, and other obstacles between the noise source and the sensitive noise receptor. To assess potential off-site noise levels associated with the proposed equipment, it was assumed that a sound level drops 6 dBA for every doubling of the distance from the source (AEUB 2007).

The off-site noise receptors nearest to the proposed ESIF would be homes just south of the Visitors Center. As shown on Figures 3-12 and 3-13, these off-site receptor areas are approximately 150 meters (500 feet) from the proposed ESIF location 1 (Figure 3-12) and 300 meters (1,000 feet) from location 2 (Figure 3-13). There are structures located between the noise source (the ESIF) and the receptors (the homes), which makes it difficult to quantify the noise impact from the proposed ESIF at these locations. However, applying the assumption that the loudest source of noise at the ESIF could generate 80 dBA at a distance of 6 meters (20 feet), the noise level at the nearest off-site receptors would be approximately 68 dBA for location 1 and 62 dBA for location 2. For comparison, 45 dBA is approximately the ambient noise level in quiet agricultural areas, while 62 dBA and 68 dBA are similar to urban residential areas affected by roadways (EPA 1978). The noise from the ESIF, which would be intermittent, would likely not be noticeable over ambient residential neighborhood, street, and highway noise. Operational noise from the Visitors Center upgrades would be very similar to operational noise from the center's current operations. Because proposed operations would be inside, there would be only a minor increment to the existing ambient noise in the project area. With the exception of the new parking lots, operation of the proposed site infrastructure improvements (power, water, and telecommunications devices, etc.) would result in little, if any, additional ambient on-site noise. Operation of the parking lots would result in elevated ambient noise twice each working day during rush hour. Implementation and enforcement of on-site speed limits would mitigate a portion of the rush-hour traffic noise.

Typical A-Weighted Range of Common Sounds

Common Sounds	***dBA***
Chain Saw	102-114
Diesel Locomotive at 50 ft	87-102
Snowmobile including wind effects	86-109
Motorcycle	80-110
Power Lawnmower	80-95
Heavy Truck at 50 ft	77-89
Food Disposer	67-93
Home Shop Tools	65-110
Food Blender	63-87
Automobile at 50 ft	60-90
Vacuum Cleaner	60-85
Air Conditioner (window units)	60-72
Clothes Dryer	50-72
Washing Machine	47-78
Refrigerator	46-68

Source: EPA 1978

Second Access Road Operations

The expected peak-hour traffic associated with operation of any of the second access road corridors would be approximately 300 additional vehicles per hour during the morning and evening rush hours.

Corridor A

Traffic within Corridor A would have potential noise effects on the residences along Quaker Street as a result of noise emanating from employee and visitor vehicles and delivery trucks entering and exiting the project area. Potential average noise level increases would likely be limited to moderate changes in the ambient noise environment due to the morning and evening rush hours as well as the distance between the new roadway (centerline) and potential sensitive receptors. The traffic mitigation plan, which features a flextime provision that would expand the duration of the morning and evening rush hours to about 2.5 hours, would further reduce potential traffic noise generated as a result of the Proposed Action.

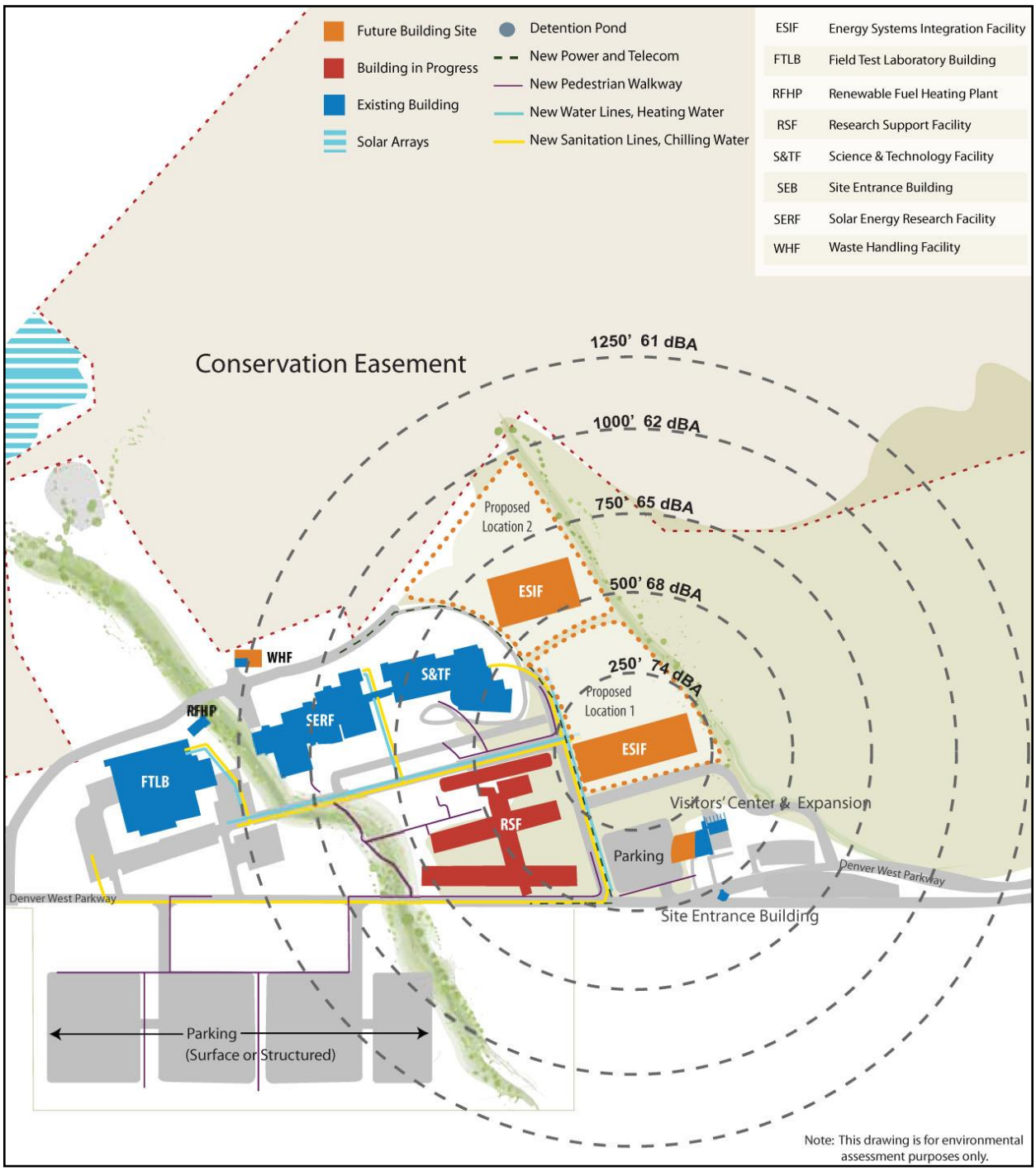

Figure 3-12. Expected Noise Levels from ESIF Operations – Proposed Location 1

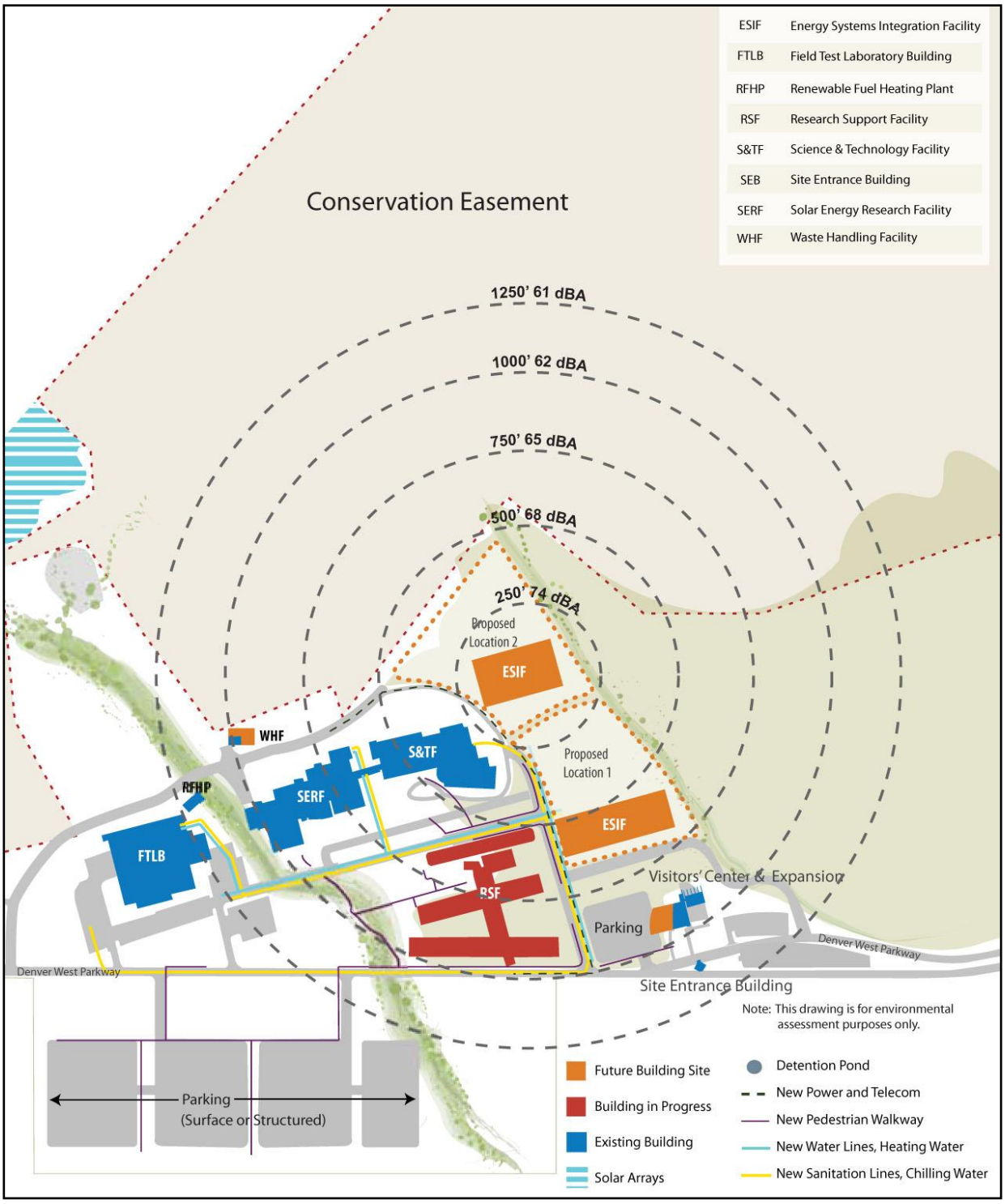

Figure 3-13. Expected Noise Levels from ESIF Operations – Proposed Location 2

Corridor B/C

Residents located to the west of the STM site could experience an increase in average noise levels as a result of noise emanating from employee and visitor vehicles and delivery trucks entering and exiting the project area. Potential average noise level increases would likely be limited to small changes in the ambient noise environment since the majority of the traffic noise would be limited to normal morning and evening work hours (6:30 to 8:30 AM and 4:30 to 6:30 PM). Moreover, based on the distance between the proposed roadway (centerline) and potential sensitive receptors adjacent to Corridors B and C, the average noise equivalency levels are not expected to increase to levels where adverse noise levels would be experienced. Moreover, NREL's traffic mitigation plan includes a flextime provision that would expand the duration of the morning and evening rush hours to about 2.5 hours, thereby further reducing the amount of traffic noise potentially generated as a result of the Proposed Action.

Corridor B/D

Residents located on to the west and south of the STM site and receptors adjacent to Isabell Street (Corridor D) could experience an increase in average noise levels as a result of noise emanating from employee and visitor vehicles and delivery trucks entering and exiting the project area. Inmates at the state correctional facility and CDOT and State Highway Patrol workers along Kilmer Street could be affected. Potential average noise level increases would likely be limited to small changes in the ambient noise environment due to the morning and evening rush hours as well as the distance between the proposed roadway (centerline) and potential sensitive receptors. The traffic mitigation plan, which features a flextime provision that would expand the duration of the morning and evening rush hours to about 2.5 hours, would further reduce potential traffic noise generated as a result of the Proposed Action.

Corridor E

Residents located on Isabell Street adjacent to Corridor E could experience an increase in average noise levels as a result of noise emanating from employee and visitor vehicles and delivery trucks entering and exiting the project area. Potential average noise level increases would likely be limited to moderate changes in the ambient noise environment due to the morning and evening rush hours as well as the distance between the proposed roadway (centerline) and potential sensitive receptors. The traffic mitigation plan, which features a flextime provision that would expand the duration of the morning and evening rush hours to about 2.5 hours, would further reduce potential traffic noise generated as a result of the Proposed Action.

3.1.12 Public Services and Utilities

3.1.12.1 Existing Environment

The discussion of the existing public services and utilities environment (electricity and gas, telecommunications, water, sewage service, emergency response and fire protection) provided in the SWEA remains current.

3.1.12.2 Impacts of the Proposed Action

In the SWEA, DOE found that planned and contemplated expansions would not significantly affect the local and regional public service and utility infrastructure. In summary, the SWEA found the following:

- The increased demand for electricity and gas by the proposed facilities at the STM site is not expected to be substantial with respect to Xcel Energy's overall capacity or local infrastructure. The new demand would not contribute substantially to peak-period power demand and associated power generation capacities.
- The Proposed Action would improve and extend the on-site telecommunications infrastructure to support new research and development activities, facilities, and an increasing number of employees on the site. No off-site infrastructure requirements would be needed, and the capacity of local service would not be adversely affected by the proposed improvements.
- The Proposed Action would incrementally increase the demand for domestic water and would require modifications and upgrades to the on-site domestic water infrastructure. The capacity of on-site infrastructure would be adequate with contemplated improvements. The current water system would accommodate additional buildings and associated office areas and restroom facilities with the addition of an underground pipe that would be installed from new buildings to the nearest domestic water loop. The long-term water system infrastructure and supplies are considered adequate to serve the site for the foreseeable future.
- The Proposed Action would increase demand on existing sewer infrastructure and treatment facilities associated with the Pleasant View Water and Sanitation District. The existing on-site system is considered adequate for current and anticipated future sewage needs. The capacity of the Metro Wastewater Reclamation District's downstream treatment plant in Denver is adequate to accommodate regional sewage needs for the foreseeable future.
- The proposed facilities and additional staff associated with the Proposed Action would incrementally increase demand for police, fire, and ambulance services, but the increases would be considered minor given site use, on-site security, and anticipated needs for emergency service providers. Moreover, NREL must contract for fire and ambulance services at the STM site and would pay for any increased LOS that is needed.

The impact of the Proposed Action that is the subject of this ~~draft~~ SWEA/S-II on the local and regional public service and utility infrastructure is bounded by the impacts discussed in the SWEA (DOE 2003).

3.1.13 Environmental Justice

3.1.13.1 Existing Environment

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629), directs federal agencies to identify and address, as appropriate, any activities that may affect minority and low-income populations. Minorities have been defined as individuals who are members of the following population groups: American Indian or Alaska Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. A minority population has been identified where the minority population of the affected area exceeds 50 percent of the population. Low-income populations are groups with an annual income below the poverty threshold.

In SWEA/S-I (DOE 2008), DOE provided a detailed characterization of low-income and minority populations in the area surrounding the STM site; those analyses are incorporated by reference. Based on the detail analyses, it was determined that there are no census block groups of low-income households adjacent to or within a few miles of the STM site, and that the nearest census block with a minority population of more than 50 percent occurs about 400 meters (1,300 feet, or about one-quarter mile) south of the STM site. There are no census blocks with minority populations of more than 50 percent adjacent to the STM site.

3.1.13.2 Impacts of the Proposed Action

The proposed projects would not disproportionately affect members of a low-income or minority population because no low-income households are adjacent to or within a few miles of the STM site, and no minority populations of more than 50 percent are adjacent to the STM site. Additionally, the nearest minority population of more than 50 percent which occurs about 400 meters (1,300 feet, or about one-quarter mile) south of the STM site, would not be affected by development within any of the second access road alternatives.

3.1.14 Intentional Destructive Acts

The DOE Office of General Counsel has issued interim guidance stipulating that each DOE environmental impact statement (EIS) and EA should explicitly consider intentional destructive acts (i.e., acts of sabotage or terrorism). DOE applied a sliding scale in considering the potential impacts of intentional destructive acts within the context of the Proposed Action.

None of the proposed projects that are the subject of this ~~draft~~ SWEA/S-II would involve the transportation, storage, or use of large quantities of radioactive, reactive, or explosive materials. Consequently, it is highly unlikely that any element of the Proposed Action would be viewed as a potential target by saboteurs or terrorists. The Proposed Action would not offer any credible targets of opportunity for terrorists or saboteurs to inflict significant adverse impacts to human life, health, or safety, nor would the Proposed Action render the STM site as a whole any more susceptible to such acts. However, the consequences of an operational accident as defined in Section 3.1.3 could occur if initiated by an act of terrorism or sabotage.

3.1.15 Energy Efficiency and Sustainability

Sections 3.12 and 4.12 of the SWEA addressed energy efficiency, renewable energy, and sustainability at NREL. That EA emphasized that NREL takes energy conservation seriously and has implemented a comprehensive energy program as part of the "Sustainable NREL" initiative. NREL has a standing goal to reduce conventional energy use and views itself as a "model for the nation" in terms of sustainable technologies and designs. The proposed action addressed in the SWEA had a complex impact on energy efficiency and sustainability because it would increase on-site energy demand, would generate small amounts of electricity for use on-site, and was expected to contribute substantially to nationwide and possibly global use of energy efficiency and renewable energy technology. However, overall, the proposed action addressed in the SWEA had a beneficial impact on energy efficiency and renewable energy. These conclusions bound the impact of the Proposed Action that is the subject of this ~~draft~~ SWEA/S-II.

The construction and operation of the proposed ESIF, the installation of Phase 2 of planned site infrastructure improvements, and the proposed expansions of the Visitors Center and the WHF would increase on-site energy demand. However, the expanded research capacity realized from these actions would contribute directly or indirectly to national (and possibly global) energy efficiency and renewable energy technology development. The ESIF would incorporate energy efficiency, environmental performance, and advanced controls using a "whole building" integrated design approach and would be required to comply with Energy Star standards. In support of DOE's goal to demonstrate energy-efficient buildings with a lower impact on the environment, the proposed ESIF and the Visitors Center expansion would be designed to merit at least a LEED "Gold" rating from the U.S. Green Building Council.

3.2 Environmental Consequences of the No Action Alternative

The No Action Alternative assumes that operations of the existing facilities at the STM site would continue, but that the five site development activities that make up the Proposed Action described in this ~~draft~~ SWEA/S-II would not occur. As such, the No Action Alternative is not tantamount to stating that no change or growth would occur at the site. Regardless of whether or not the Proposed Action is implemented, in the foreseeable future NREL would experience normal minor fluctuations, including growth, in staff levels, resource use, and environmental impacts due to currently authorized and planned programmatic growth and research activities that are not associated with the Proposed Action, but which would not cross the significance threshold under NEPA that would require separate evaluation under an EA or EIS. No major or significant proposed actions, as defined by CEQ (40 CFR 1508.27), would be taken under the No Action Alternative.

The environmental consequences of the No Action Alternative would be very similar, and in some instances identical, to the environmental consequences of the no action alternative presented in the SWEA. These are summarized or updated below.

Under the No Action Alternative, the proposed ESIF, Visitors Center and WHF expansions, second access road, and associated site improvements would not be undertaken. The impacts under the No Action Alternative would be as follows:

- Existing on-site land uses, site development density, and operations would continue to experience normal growth but would not be impacted or accelerated by the proposed ESIF, Visitors Center and WHF expansions, second access road, or associated site improvements. Fewer local beneficial economic impacts would result because construction would not occur, and related job growth and NREL development would be more limited.
- The incremental impacts to traffic and parking from site construction and from development of a new second access road would be avoided. Changes to on-site and off-site traffic patterns due to adding a second access road and staffing the proposed ESIF, expanded WHF, and expanded Visitors Center would be avoided.
- Emissions of criteria air pollutants and toxic air pollutants from the ESIF would not occur. In the short term, air emissions from site operations would remain at approximately current levels; in the longer term, increases in emissions would occur due to normal site growth and development.
- Noise associated with the construction and operation of the proposed ESIF, WHF and Visitors Center expansions, second access road, and associated improvements would not occur because these projects would not be developed. Current levels of ambient noise levels at the site would remain the same. Off-site noise levels in the area would continue to be dominated by vehicle traffic on I-70.
- There would be no increased runoff or impacts to surface water, stormwater, or groundwater resources from the paving over of land for the proposed new parking lots, roads, ESIF, and WHF and Visitors Center expansions.
- The loss of grassland habitat due to paving and building construction would not occur.
- In the short term, the quantities and types of hazardous materials and hazardous wastes generated at the site would remain at approximately current levels; in the longer term, increases in waste generation would occur due to normal site growth and development.

- Any incremental capacity impacts on existing service providers resulting from the Proposed Action and the impacts of associated infrastructure improvements would be avoided.
- In the short term, the site's energy consumption would remain at approximately current levels; in the longer term, increases in energy consumption would occur due to normal growth and development.